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Railway Age

DAILY EDITION

FIRST HALF OF 1922, No. 24c NEW YORK—TUESDAY, JUNE 20, 1922—ATLANTIC CITY SIXTY-SEVENTH YEAR

Published weekly by Simmons-Boardman Pub. Co., Woolworth Bldg., New York, N. Y. Subscription Price, U. S., Canada and Mexico, $6.00; foreign countries (excepting daily editions), $8.00; single copies, 25c. Entered as second-class matter, January 30, 1918, at the post office at New York, N. Y., under the act of March 3, 1879.

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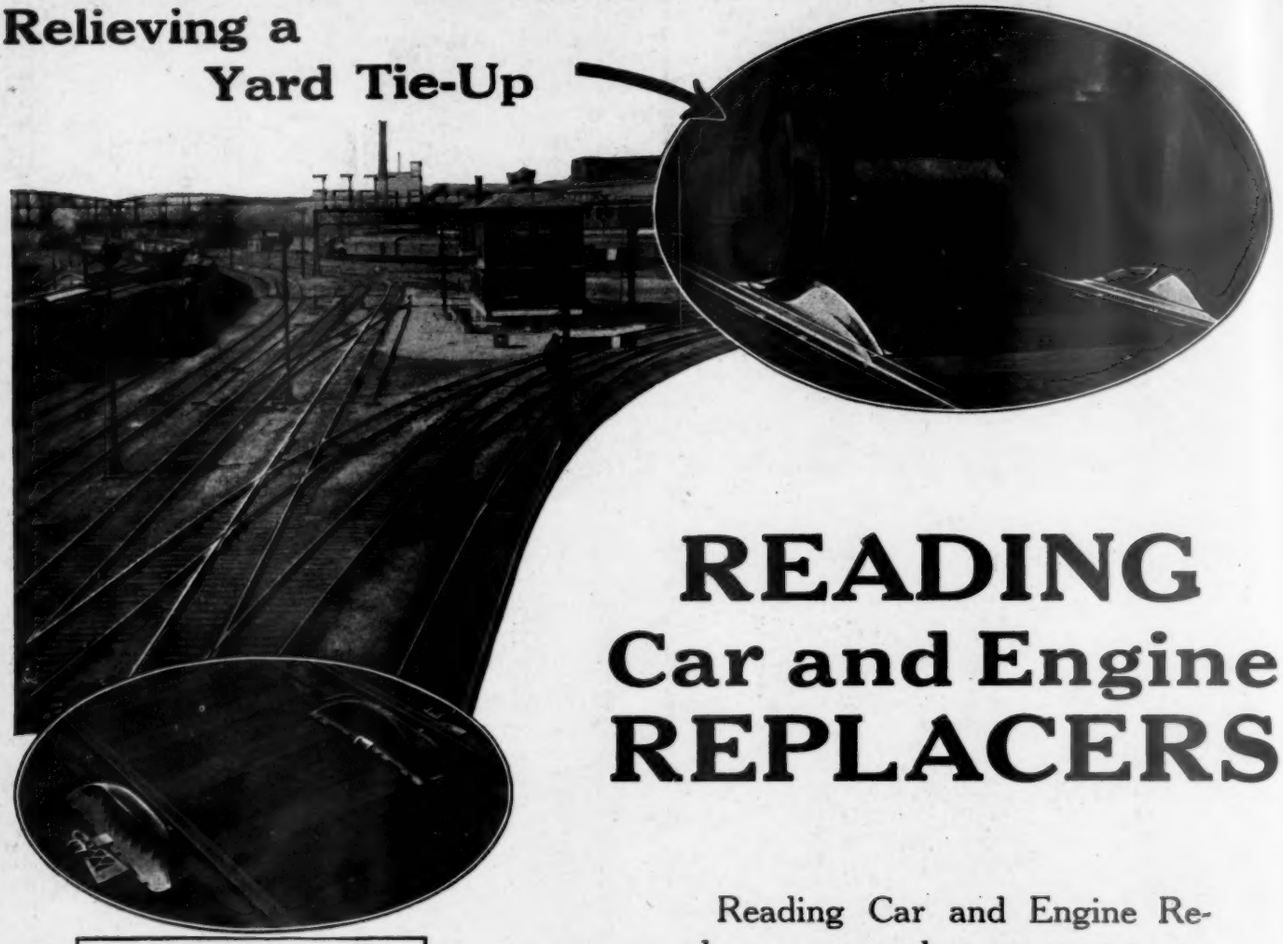

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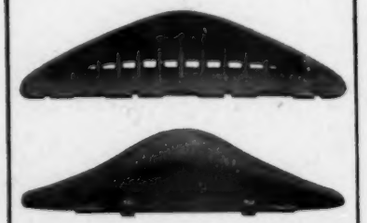

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Railway Age

DAILY EDITION

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VOLUME 72 JUNE 20, 1922 NUMBER 24c

PUBLISHED EVERY SATURDAY AND DAILY EIGHT TIMES IN JUNE BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

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Entered at the Post Office of New York, N. Y., as mail matter of the second class.

Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free; United States, Mexico and Canada $6.00. Foreign Countries (excepting daily editions), $8.00. Foreign subscriptions may be paid through our London office in £ s. d. Single copies, 25 cents each.

WE GUARANTEE that of this issue, 12,400 copies were printed; that of these 12,400 copies, 10,300 were mailed to regular paid subscribers to the Railway Age and Railway Mechanical Engineer; 110 were mailed to advertisers; 490 were provided for counter and news companies sales, new subscriptions, bound volumes, samples, copies lost in the mail and office use; and 1,500 copies for distribution at Atlantic City.

THE RAILWAY AGE is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.)

In spite of any and all arguments for or against classification of material for accounting purposes, it is believed that the Interstate Commerce Commission will eventually demand it. That being the case, it is largely a waste of valuable time and energy to argue anything except the items in the classification. By acting well in advance of the I. C. C., the Purchases and Stores Division of the A. R. A., the members of which are the real experts in their line, can prepare a classification that will best meet the railways' needs and which will be acceptable to the Commission. The only really valuable discussion on this subject during yesterday's session consisted of the few remarks which questioned the classification in which certain items were placed. It is very clear that any classification at best is liable to be confusing. It is therefore necessary that the problem be given very careful consideration. The Purchases and Stores Division can well afford to pick a select committee to handle this important subject and this committee should call for and analyze carefully suggestions from the membership of the association. Above all things it should be ready with something concrete, definite, simple and logical when the time comes that the Interstate Commerce Commission asks for advice on this matter. It is by such service that our railway associations can serve the railways as a whole.

Classification of Material

In considering the various systems of automatic train control that have been developed, there appears to be two distinct types—the ramp and contact shoe type, and the magnetic induction type. Either type requires more or less equipment on the locomotive and with some systems the electrical circuits are so complicated that they can only be properly tested and maintained by men skilled in such work. It is this feature which is certain to cause a division of responsibility between the electrical and the signal departments—at least, as they are organized at present. Heretofore, the signal men have had no association whatever with locomotives, nor have the electrical men had anything to do with signals. The electrical department, however, has charge of headlight equipment and it seems but logical that the same men should look after such electrical apparatus as is carried on the locomotive. Herein lies a new field for the electrical engineer, which he would do well to familiarize himself with, since it is likely to prove a considerable and interesting addition to his rapidly widening scope of activities.

Electrical Men and Automatic Train Control

Planers, like drills and engine lathes, are so commonly found in railroad shops as to be taken pretty much for granted. Yet these machines are employed in such large numbers that unless modern efficient types are used there is a big aggregate loss in their operation. Much has been said, and rightly so, about the need for milling machines and other production tools in railroad shops but this does not mean that the planer has in any sense of the word outlived its usefulness. In fact in the last analysis of railway machine shop work of which we are aware, 28 per cent of the machine operations were performed on lathes, drills handled 17 per cent, and planers 11 per cent of the total machine operations. As indicated by the 11 per cent proportion there is no lack of machine work to keep planers busy. There may be some overlapping of the fields for planing and milling work, but as a rule the fields are quite distinctly marked. In general for production work on similar parts the milling machine is best adapted, but for miscellaneous machine operations the planer is by far the more adaptable tool and does not involve the same expense for cutters. It would appear, therefore, there will always be enough planer work in railroad shops to warrant the installation of the best modern machines which it is possible to obtain.

Have Planers Outlived Their Usefulness?

Anyone who was in attendance yesterday morning during the presentation and discussion of the report on Locomotive Headlights and Classification Lamps could not help being impressed by the manner in which it was done. The short but meaty report was read slowly and carefully by A. R. Ayers of the Nickel Plate, while all the members present paid close attention. Mr. Ayers elaborated on the report sufficiently to hold the interest of his listeners and the report was then discussed exhaustively for the better part of an hour, with eight different men taking part. The only unfortunate condition was the lack of electrical men present. When the discussion led to matters which were purely electrical, there was no one to an-

Headlights a Live Subject

swer the questions raised. This was due to the fact that the Association of Railway Electrical Engineers was holding its semi-annual meeting at the same time at the Hotel Dennis, where the same report was being discussed. The headlight report was placed first on the program of the Mechanical Division so that electrical men could leave the Mechanical Division meeting and go to the Electrical Engineers' meeting, but because of a misunderstanding most of the electrical men were not able to attend both meetings. The two discussions if combined will contain all of the desired information. It is to be hoped that in the future such conflicts will be avoided and that provision for joint meetings will be made in such cases.

Enginehouse Work Specialized

One of the best ways to prepare engine terminal forces for handling work with the greatest speed, accuracy and thoroughness is by the development of specialized gangs responsible for various phases of the work. The extent to which this specialization can be carried out will depend largely on the size of the terminal, but even at points turning only a comparatively few locomotives some degree of specialization can be employed profitably. It goes without saying that the men who clean fires and handle ashes are thoroughly familiar with this work and under the proper supervision accomplish it with the least expenditure of time and energy. Within the roundhouse, it will also be found a paying proposition to have certain men handle a definite class of repair work. As examples of the work which may be specialized, experience has shown that one man can look out for piston and valve packing, the adjustment of driving box wedges and the reseating of exhaust tips when they leak. It is a big advantage to have one man who is responsible for this work and to whom the foreman can look for thoroughness. Not only that, but the specialist on any job naturally becomes more familiar with it than the man who works at it only occasionally and the result is a better grade of work done in a shorter time. Box packers, rod cup men and mechanics working on truck bearings can also be trained for their particular work and make a specialty of it with resultant important savings.

Headlights and Cab Wiring

The commercial interest in electric headlights has apparently settled down to a steady replacement market. If the law has been complied with, the number of locomotives that are operated without electric headlights is comparatively small. This does not mean that the final chapter in locomotive head-lighting has been written, for it is altogether improbable that any great number of wiring systems now in use can be considered as perfect. Changes and revisions for the improvement of both headlights and cab lights are certain to be made from time to time in accordance with the ideas of the men in charge of this work on the different roads. As in all other operating problems, the electrical engineer's goal is a record of perfect performance and to achieve such a record he must look to the quality of materials used and manner of installing them. Good headlight equipment will function to just about the same degree of reliability as it receives careful maintenance. Several problems still remain unsolved, and this is not to be wondered at when one considers the wholesale application of electric headlights in a comparatively short time. Questions of ball bearing sizes, lubrication and location of equipment are among those which have not yet been solved to everyone's satisfaction. It is easy enough to disapprove of certain practices and methods, but the man who performs his full duty is the one who by careful analysis of conditions is able to offer constructive suggestions, which if applied will manifest themselves in better service at a lower cost.

Support Your Foremen

The following extract is taken from a letter written by a railroad shop foreman. "And personal loyalty! There is no such thing. The reason? Because when in a doubtful situation we cannot go to our superior with our problem. He no longer encourages and points out the way with wisdom and knowledge begot of long experience—he applies the goad; he is not an adviser, he is a driver! * * * This is not inspired by any feeling toward some particular officer, but is the result or conclusion reached by one who has met and compared experiences with many foremen on different roads and represents the average position on the subject. * * * I am sure that it is useless for us to attempt to keep up with progress by reading and observation, when all that is wanted is a good strong whip hand." We may question the logic of the writer and his peculiar conclusion. On the other hand, he clearly reflects conditions that are deplorable. Let us hope that they pertain to very few roads or shops. How can we, however, hope to develop a spirit of good-will and co-operation between the men and the managements if the key men, or the connecting links, feel as does this man? You may say that such conditions do not exist on your own road, but are you doing everything that you should to encourage loyalty on the part of the foremen and subordinate officers? Are you seeing that they are fully informed as to the best practices to follow? Are you coaching them in how to manage men and enthuse them, and how to develop teamwork?

Railroads and the Lumber Industry

The discussion on the reference to the lumber specifications in the report of the Committee on Specifications and Tests for Materials, while not generally participated in, reflects a situation which is far from satisfactory and is attracting a growing amount of attention both from railroad men and the lumber industry. The customs of the lumber trade with respect to grading rules vary widely in different territories and the grades are so loosely defined that there is considerable latitude for variations in their interpretation. This has led to much misunderstanding between the purchaser on the one hand and the wholesaler and producer on the other. The producers claim that railway specifications are difficult to adhere to without considerable waste in production that the purchaser pays for, whether he knows it or not. When lumber is bought on price, which is quite generally the practice, the temptation is open to the bidder to make concessions in order to secure the business; for these he reimburses himself by a loose interpretation of the grading rules, the effect of which is to include as much material as possible that a strict interpretation would place in the next lower grade and exclude at the top of the grade material which might strictly be included. In other words, the railroad gets just what it pays for. This situation is in need of careful study, not only to promote better relations between the railroads and the lumber industry, but to provide for more economical use of the lumber resources of the country. While it is true that the user is in the better position to

decide the question as to what character of material is most satisfactory for his purposes, is it not possible that some concession as to patterns and sizes, in order that more liberal use of commercial patterns may be made, would result in better prices to the railroads without the sacrifice of quality that is a corallary of the present policy of buying on price? A movement is now under way to bring about a better understanding between the various lumber interests and the users of this material in which the American Railway Association is represented, and it is sincerely to be hoped that some very definite results may be accomplished.

Help The Stores Department

Anyone who has watched a lively rally between professional tennis players is reminded of the way in which mechanical and stores department men sometimes "pass the buck" between each other. To see the way these departments often work one would never suspect that they are each a sub-division of the same transportation system whose sole duty is the provision of adequate transportation at a minimum cost. The mechanical department can help itself as well as the stores department by determining its material needs at the earliest possible time and notifying the stores department without delay. Comparatively large items like new cylinders, steel underframes, or deck castings are usually shown on work reports placed in the hands of shop men and storekeepers before an engine or car comes to the shop. It is the smaller items which often escape attention and which in the aggregate cause equipment delays due to inability of the stores department to furnish material promptly. As far as possible the needs for material should be anticipated. For example, it is becoming more and more customary to manufacture certain standard parts, such as cylinder and valve packing, at central plants, which may be at some distance from outlying terminals. Suppose that the cylinder bushings on a certain class of locomotives are worn almost to the limit. The stores department should be advised of this fact and arrangements made for the prompt shipping of smaller packing rings as soon as new bushing are applied, whereas, based on consumption records, the storekeeper would probably have on hand only rings which were too large. Making the storekeeper acquainted with the condition of these bushings will also give him a chance to see that new bushings are ordered and on hand for application to the locomotives as needed. This is simply one of hundreds of ways in which mechanical men can greatly assist the stores department, at the same time expediting repair work. The storekeepers should be advised of material needed for new power. They should know as soon as parts are superseded by new designs; otherwise these parts will continue to be ordered, based on consumption records, for a considerable time after they are obsolete. The stores and mechanical departments can often co-operate in at least partially using up obsolete material.

A Suggestion to the Committees

Although there was a lively discussion following the presentation of the report of the Committee on Specifications and Tests for Materials at yesterday morning's session, it was noticeable that almost none of the speakers referred in detail to the specifications proposed by the committee that were contained in the appendices to the report. In order to touch on the provisions of any of these specifications a thorough study of the text of the appendices would be required and for any of the members except those whose work throws them in daily contact with material specifications, even this would give little insight into their exact purpose. Similarly, few of the members are able to discuss in detail on their merits the recommendations of other committees whose work is largely the formulation of standards. No doubt, all of these committees have well defined reasons why they believe that their recommendations should be adopted, and the development of these reasons has probably constituted no small part of the committee work. Would it not make possible a much more thorough consideration of the subjects if the committees were to set forth at some length the reasons why these recommendations are made and explain how they may be expected to operate? The subjects are all matters in which the members are interested and on the broader phases of which they are in a position to comment intelligently, not only with benefit to the committees in their future work, but also with the possibility of crystallizing much more intelligent opinions of the requirements of the situation among the members of the Mechanical Division before the recommendations are presented to them for letter ballot.

Railroad Clubs and Their Opportunities

Many of the convention attendants probably read with interest and enthusiasm the interview published yesterday in which George M. Basford made some observations on the opportunities afforded by the railroad clubs. Most of these clubs started out under the leadership of mechanical department men and for a long time confined their discussions largely to mechanical subjects. Some clubs, like the New York, have always covered a wider field and have been railroad clubs in a large sense—in fact as well as in name. This is well, for no man, regardless of what department he is in, can afford to restrict his vision and activities to that one department. One great value of the railway clubs is that they have deliberately tried to carry on educational programs which would give all of their members a larger comprehension of the relation of the various departments to each other and of the necessity for teamwork between the departments. The railroad clubs, if properly conducted, should present a fertile field for cultivating closer relationships between the higher executive officers and the subordinate officers and foremen—in helping the railroads to cultivate a family spirit. If they can be only a partial factor in bringing this about they will repay many, many times over all the energy and effort which have been expended in developing them. Executives like Presidents Besler of the Central of New Jersey, Hedley of the Interborough, Pearson of the New Haven, Hustis of the Boston & Maine, and many others, will never know how much their friendly interests in the railroad clubs have done to encourage the subordinate officers and foremen. Just so far as this good work is continued, so much greater will be the opportunity for the development of the younger men and the opportunities for good as outlined in Mr. Basford's address.

Machinery Hall Teaches a Lesson

Operated on a non-competitive basis and considered more or less an auxiliary of the transportation business, railroad shops often use obsolete and worn-out machine tools which would not be tolerated in any other business—which could not, in fact, be tolerated if that business were to meet competitors' prices and survive. The need of modern machine tools in railroad shops has been demonstrated many times

and is quite generally admitted. In size, diversity and labor-saving possibilities the exhibition in Machinery Hall this year is perhaps the most remarkable machinery exhibition yet held. Volumes would be required to explain in detail the merits of the lathes, planers, shapers, grinders, drilling, boring, forging and other machines exhibited. In general these tools embody the admirable features of design developed by modern manufacturers, including ample strength to push high-speed tools to the limit and maximum convenience of operation. The ease and speed with which operating adjustments to these machines can be made are truly wonderful. Railroads as well as other industries should benefit by the resulting high production. As one shop superintendent said, "It seems almost criminal that we should be struggling along with inefficient, old machines when tools are on the market able to do the work of four or more of the old ones." What is the answer? One live-wire master mechanic has supplied it as follows: "Find out if the new machines will show a net return of 15 per cent on the investment; put the facts up to the proper authorities and the necessary appropriations will be made." Of course, many railways continue to use obsolete machine tools because of difficulty in raising the new capital required to provide them as well as other improvements; but, really, is not this an explanation which is often overworked?

Selection of Special Apprentices

THIS IS THE TIME of the year when the technical graduate completes his college course and is available for employment. The majority will be ready to report for work July 1. It is only in the spring of the year at the close of the second semester of college that this class of employe can be secured. Many of them have already been placed for this year. If selection has not yet been made, those roads which desire to train some of these young men as special apprentices must make arrangements within the next week or two, or the supply of available material will be exhausted, and the roads will be required to wait another year before receiving applications for these special apprenticeships.

In one way it is unfortunate that these men are on the market for employment at this particular time, when many roads are feeling the necessity for reductions in expenses, and consequently are slow to increase the number of any class of employes, or to increase the payroll by employment of a class of men not heretofore employed. On the other hand it is fortunate for the railroads that the present business depression throughout the country has lessened the opportunities open to these young men with engineering and manufacturing concerns and has made many more of the better type of the graduates in mechanical engineering available for railroad employment this spring. There never was a time when so many of these young men desired to enter railroad work. The railroads should take advantage of this opportunity to pick out some desirable college graduates and start them on a course of training.

Some roads have already made selections, having followed the practice of the commercial concerns by sending representatives to the engineering schools to explain the system of training offered, discuss the opportunities open, and to interview prospective applicants. This plan is most commendable. Railroads inspect materials and equipment purchased. It is equally important that brains purchased be likewise inspected. One reason the special apprentice has not been held in higher repute has been due to the fact that the industrial concerns went after and secured the cream, those coming to the railroads being in many cases the left-overs—those with little initiative, who finding no other work available followed the line of least resistance and accepted the railroad employment with no particular liking or fitness for the work.

College graduates, like any other class of people, differ in ability, in make up, in fitness. You cannot make a purse out of sow's ear. College training merely develops the talents one possesses. It is not a guarantee of ability or fitness; it is merely a guarantee that the good man has been made better, has been developed and trained for greater usefulness. If railroads are to receive worth-while results from the training of technical graduates, care must be exercised in the selection of the men to be given the training, the most important qualifications to be considered being his liking for the work, his loyalty to his employer, his willingness to go through the routine and at times drudgery of training so essential if he is to fortify his scholastic acquirements with the practical realities and experience so necessary to fit him for useful railroad service.

Take a Broad View of it

THE GENERAL COMMITTEE of the Mechanical Division will soon have to determine how long next year's convention will last, what subjects shall be reported on and discussed and whether there shall be an exhibit. The question of confining the convention within a single week has been directly raised. It is believed by some that money could be saved in this way. It could be. The important point to consider is not merely what would be saved, but what might be lost.

Directly and indirectly the mechanical department officers determine whether expenditures for maintenance of equipment and for fuel which recently have exceeded $2,000,000,000 a year shall be made to the best advantage. What is the total cost of the conventions and the exhibit compared with that huge sum? A slight decline in the efficiency of the mechanical departments would cost many times more than all the direct and indirect expenses of the conventions and exhibit, while a slight increase in the efficiency of the mechanical departments of the railroads would save a corresponding amount.

The real question is how best to promote the efficiency of the mechanical departments. The best way to promote it is to enlarge the opportunities, increase the knowledge, broaden the vision and stimulate the initiative of all officers of the mechanical department, from superintendents of motive power and master car builders down to foremen and assistant foremen. Will this be better done by reducing the length of the mechanical convention, and thereby restricting the number of subjects that can be considered, and the fullness with which they can be discussed, as well as the thoroughness with which the equipment and devices on exhibition can be studied; or will it be better done by continuing to have the convention extend over parts of two weeks, and increasing the number of subjects considered, encouraging full and free discussion of them and giving full opportunity to study the exhibits? When the conventions extend over two weeks more people can attend because they can come in two relays.

The railways should be developed, managed and operated with the greatest possible efficiency and economy. But the future as well as the present must be considered. They cannot be developed, managed and operated as efficiently in the future as they have been in the past without equally intelligent, broad and capable officers. Broad education as well as the best experience and training are necessary to the making of such officers. The technical

associations of the railways have done much to educate the past and present generations of officers. Are these associations to cease to be forums for the full, constructive discussion of technical problems and to be reduced to the mere role of registering standards regarding comparatively unimportant matters? If so, the technical officers of the next generation will not be equal to their duties and responsibilities, for they will lack the necessary education and breadth of vision.

We believe many men, including many executive officers, are thinking entirely too much about what association work costs the railways and much too little about what it has saved them in the past and can be made to save them in the future. As the *Daily Railway Age* said yesterday, the conventions should be highly educational as well as legislative. They should be used to make better officers as well as better methods and standards; in fact, without better officers the railways will never be able to develop and adopt better standards.

The giving of excessive attention to immediate and relatively small economies, largely in disregard of the effect they may have in the long run on the major expense accounts of railway operation, will save hundreds or thousands of dollars now, but cost millions of dollars later.

Today's Program

Three railroad associations will hold meetings in Atlantic City today.

Division VI, Purchases and Stores, A. R. A.

The meeting will be held in the Hotel Traymore, beginning sharp at 9 a.m.

	A.M.	A.M.
Discussion of Reports on:		
Subject 4—Material Accounting and Mechanical Facilities	9:00 to	9:30
Subject 21—Unit Piling of Materials and Numerical Numbering System, and Moving Picture Illustration of Unit Piling	9:30 to	10:30
Subject 16—Supply Train Operation	10:30 to	11:00
Subject 10—Scrap Classification — Handling and Sales	11:00 to	11:30 M
Subject 12—Purchasing Agent's Office Records	11:30 to	12:00 P.M.
Subject 3—Reclamation of Material	12:00 to P.M.	12:30 P.M.
Special Subject: "Inventories," by Mr. D. C. Curtis	12:30 to	1:00

Division V, Mechanical, A. R. A.

The meeting will be held in the Greek Temple on the Million Dollar Pier, beginning sharp at 9:30 a.m.

Discussion of Report on:
- Locomotive Construction.
- Feed Water Heaters.
- Modernization of Stationary Boiler Plants.

Air Brake Association

Lantern illustrated lecture by the Committee on Air Operated Auxiliary Locomotive Devices. Slides showing the graphic charts covering all phases of the maintenance of the various devices will be accompanied by a clearly explained use of the charts. A considerable number of railroads have already adopted and daily use the system proposed by the committee. The Air Brake Association also has on sale a hand-book covering in detail the committee's recommendations.

Following this illustrated lecture will be another lantern illustrated lecture on the universal passenger car equipment, submitted by the Manhattan Air Brake Club, through J. C. McCune, the secretary of the club.

Recommended Practice will be the next subject taken up.

Entertainment Features

10:30 A. M.—Orchestral Concert, Entrance Hall, Million Dollar Pier.

3:30 P. M.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier. Tea will be served at 4:30 P. M. in Entrance Hall.

9:30 P. M.—Grand Ball, Ball Room, Million Dollar Pier

Flight of the Prosperity Special

THE "PROSPERITY SPECIAL," with which everybody attending the conventions is familiar, was the most unique train ever run. Some of the railway men who saw the moving pictures and heard S. M. Vauclain's address at the Traymore on Sunday night were wondering whether the train had to be divided to go over bridges. The train ran as one section over the Pennsylvania Railroad from Philadelphia to Indianapolis. It was run in two sections from there to St. Louis, and in one section over the Cotton Belt from St. Louis to Corsicana, and over the Southern Pacific to El Paso. It is running between San Antonio and El Paso today. From there on it will be run in two sections, not because of any danger to bridges, but because of mountain grades.

The Baldwin Locomotive Works sent out circulars announcing the flight of the Prosperity Special, and there were demonstrations and celebrations in its honor at various points, most of them under the auspices of chambers of commerce, boards of trade, Rotary clubs, Kiwanis clubs, etc. The farmers along the way became especially interested at many points, and granges and other of their organizations were represented in the celebratons.

At Mansfield, Ohio, and several other places the schools were closed to give the children a chance to see the special.

At one point a farmer asked how much each locomotive cost and how much power it had. He was told the cost per engine was $75,000 and the tractive power 3,000 horsepower. "That's an average of only $25 a horse," computed the farmer. "I can't buy horses as cheap as that."

The total horsepower represented was 65,000. Every locomotive had on it an engineer who was charged with the duty of seeing that it was going along all right, and especially that the bearings did not get hot. The engineers on the fifth, eighth and thirteenth locomotives were captains, and it has been figured out that each of them had charge of the equivalent of 15,000 horses.

At Ft. Wayne the Chamber of Commerce took complete charge of the celebration, and had all the locomotives in the train strung with electric lights and a grand stand erected beside the tracks for viewing the train and for speech-making. At Indianapolis the principal speaker was former Senator Beveridge, who talked on "Permanent Prosperity for the people." At St. Louis the principal speaker was Mayor Kiel. The biggest celebration of all was at Houston, Tex., where a great crowd turned out to meet the train.

The Prosperity Special will be in Los Angeles on July 4, where it will be one of the big features of the Independence Day celebration.

A crowd so large that it had to be shown the pictures in installments attended the moving picture show illustrating the flight of the Prosperity Special, which was given by the Baldwin Locomotive Works at the Traymore, Sun-

day night. S. M. Vauclain, president of the Baldwin Works, was introduced by Grafton Greenough, vice president of the company. He said the Prosperity Special was Mr. Vauclain's sole idea. Mr. Vauclain said the purpose of the train was not merely to advertise the Baldwin Works, but to create a spirit of optimism throughout the country by giving tangible evidence that prosperity is really returning.

Frederic F. Gaines

AT THE MEETING of the Mechanical Division yesterday, C. E. Fuller paid the following tribute to the late F. F. Gaines.

"Since our last meeting, death has claimed one of our workers, Frederic F. Gaines, who passed away Friday, August 26, 1921, at his home in Washington, D. C.

"He was born at Hawley, Pa., on March 28, 1871, the eldest son of Stanley and Margaret Gaines. After graduating from the public school at Hawley, he prepared for college at the Wyoming Seminary, Kingston, Pa., and entered Sibley College in the fall of 1891. At college he proved to be a good student, specializing in locomotive engineering and was elected to Sigma Chi in his senior year. During his summer vacation he worked in the locomotive repair shops of the Erie & Wyoming Valley Railroad at Dunmore, Pa., thus beginning his active connection with railroading, which continued until his death.

"Upon graduation he entered the employ of the Lehigh Valley, being successively draftsman mechanical engineer and master mechanic. After serving the Philadelphia & Reading, as master mechanic at Reading, he was appointed superintendent of motive power of the Central Georgia at Savannah, Ga., which position he held until the formation of the United States Railroad Administration, when he was made mechanical superintendent of the Southern region with headquarters at Atlanta. Upon the creation of the Railroad Administration Board of Wages and Working Conditions, he was appointed a member and moved to Washington, serving until that body was disbanded at the end of 1920.

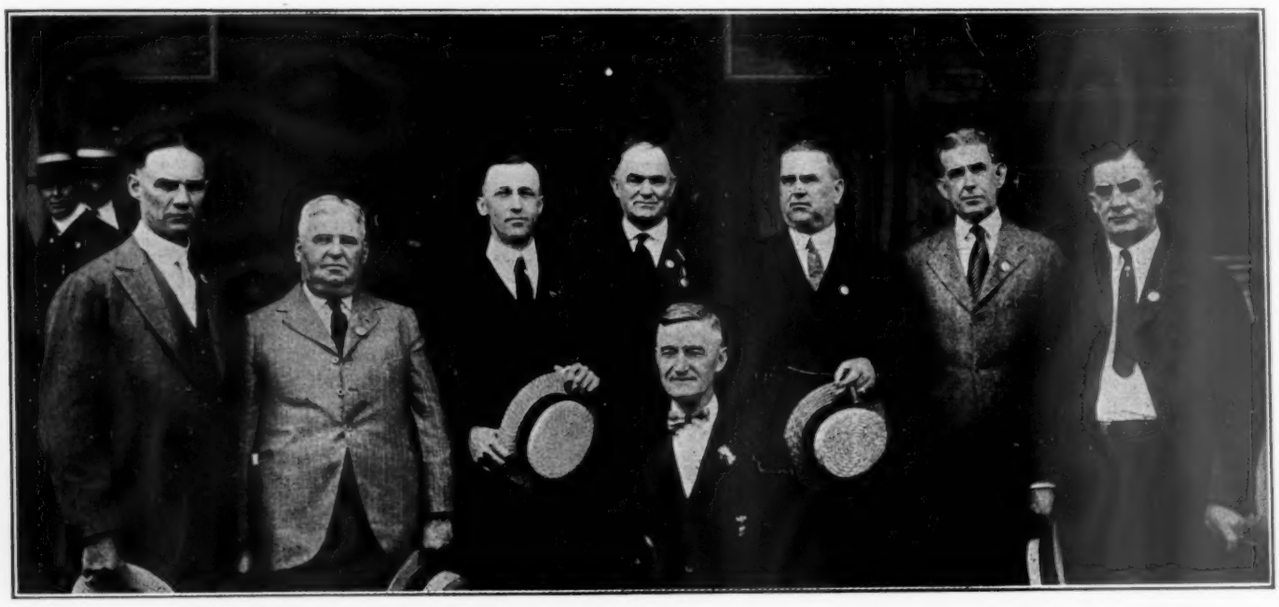
"He was the author of numerous technical papers and developed a number of inventions, of which the Gaines locomotive furnace is the most important. While with the Central of Georgia he superintended the designing and erection of the repair shops at Macon, Ga., and modernized its locomotive and car equipment.

"For many years Mr. Gaines was a prominent member of the Master Mechanics' and Master Car Builders' Associations, having served as president of the Master Mechanics' and filling this position with credit and honor. He was a man of sterling qualities, possessing a strong personality, a keen intelligence and a good knowledge of mechanical work and affairs in general.

He was a Shriner, a Knight Templar, a member of the Society of Colonial Wars and Sons of the American Revolution. He at one time served as president of the Southern and Southwestern Railway Club and was a member of the Columbia Country Club at Washington, and various clubs in Atlanta and Savannah.

"On October 5, 1897, he married Miss Frances E. Loomis, of New York City, by whom he is survived, together with a daughter, Clarissa, and a son, Frederic, Jr.

"In the death of Mr. Gaines this association and a host of friends has lost a kind, sympathetic and jovial companion."



"Courtesy George A. McKeague, Official Photographer."

Representatives of the Rock Island at the Pier Last Week

Seated: W. J. Tollerton, general mechanical superintendent, and chairman, Division V—Mechanical, A. R. A.

Standing, left to right: George S. Goodwin, mechanical engineer; J. H. Milton, superintendent car department; John Baker, chief clerk to general mechanical superintendent; S. W. Mullinix, superintendent, Silvis shops; T. H. Beacom, vice-president and general manager; W. J. O'Neill, mechanical superintendent, second district; L. A. Richardson, mechanical superintendent, first district.

American Railway Association—Division V—Mechanical

Reports on Headlights and Material Specifications; Much Interest in Axle Steels and Lumber Specifications Evident

Chairman Tollerton called the meeting to order at 10 a.m.

Locomotive Headlights and Classification Lamps

In its report for 1920 this committee submitted recommended practices regarding the capacity and voltage of the turbo-generator and its location on the locomotive, wiring, lamps and dimmers. These were later adopted by letter ballot. The present report outlines the proposed extension of the recommended practice and covers bolt spacing of the generator base and headlight casing, sizes of steam, exhaust and drain pipes, sizes of ball bearings, brushes and screw threads and lubrication. Suggestions regarding design of generators are also made.

The cleaning of the silver-plated, copper type locomotive headlight reflectors has always been troublesome. The report for this year indicates that glass reflectors which require less attention probably meet the requirements of the Interstate Commerce Commission and it is to be expected that official tests will soon be available. Other work suggested for future reports includes the preparation of maintenance regulations which, it is thought, will be of assistance to the railroads in obtaining the best possible results from electric lighting equipment on locomotives.

APPROVAL of the plan to work jointly with manufacturers of headlight turbo generators and the Association of Railway Electrical Engineers in developing certain standard practices was given this committee at the 1920 convention, and in addition it was found advisable to include manufacturers of ball bearings.

The resulting recommendations for each of the subjects referred for development, with additional recommendations for brush holders and spacing of bolt holes in base of headlamp cases, are herein submitted for consideration, it being understood, where the recommendations necessitate redesigning, that they will apply to future construction only.

The lack of uniformity in number as well as location of supports or feet on the various makes and types of turbo generators, which is illustrated in Fig. 1, renders interchange difficult, and is detrimental to the best interests of manufacturers as well as objectionable to the railroads. The spacing recommended can be adapted to future designs without much difficulty, thus overcoming the present chaotic situation.

The recommendation for the location of the steam inlet may appear to allow the manufacturer more latitude than is desirable, but to fix a definite location appeared to be an unnecessary handicap in the freedom of design. With the variation in location of steam inlet from the longitudinal and transverse center line of bolt spacing and vertically above the base plate in increments of ½ in., any make of turbo generator can be applied without the necessity of changing the steam pipe from the boiler by using standard fittings and proper lengths of pipe nipples, standard lengths of which vary by ½ in. increments.

The restriction of turbo generator manufacturers to one size of ball bearing was likewise considered as unnecessarily hampering future development, and particularly with reference to the design of the shaft. Much of the ball bearing trouble that is being experienced can be attributed to (1) rotating parts out of balance; (2) shaft running near the critical speed, producing excessive vibration; (3) shaft loose in bearings, which, existing, rapidly increases; (4) shaft too small, which, when attachments thereto are out of balance, springs out of line to seek its balance, thus throwing bearings out of alignment; (5) faulty design of bearing housing, which permits dirt to work into bearings. This condition is aggravated by centrifugal action of revolving parts,

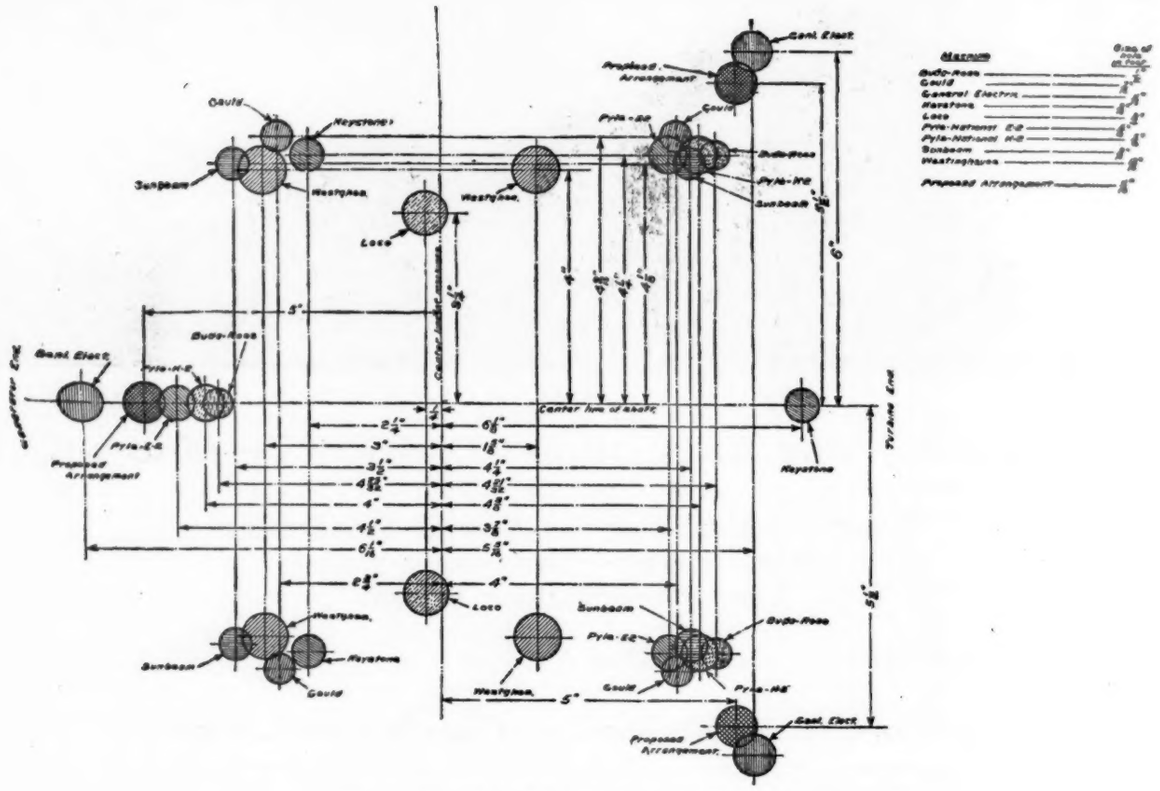


Fig. 1—Location of Supports on Turbo Generators

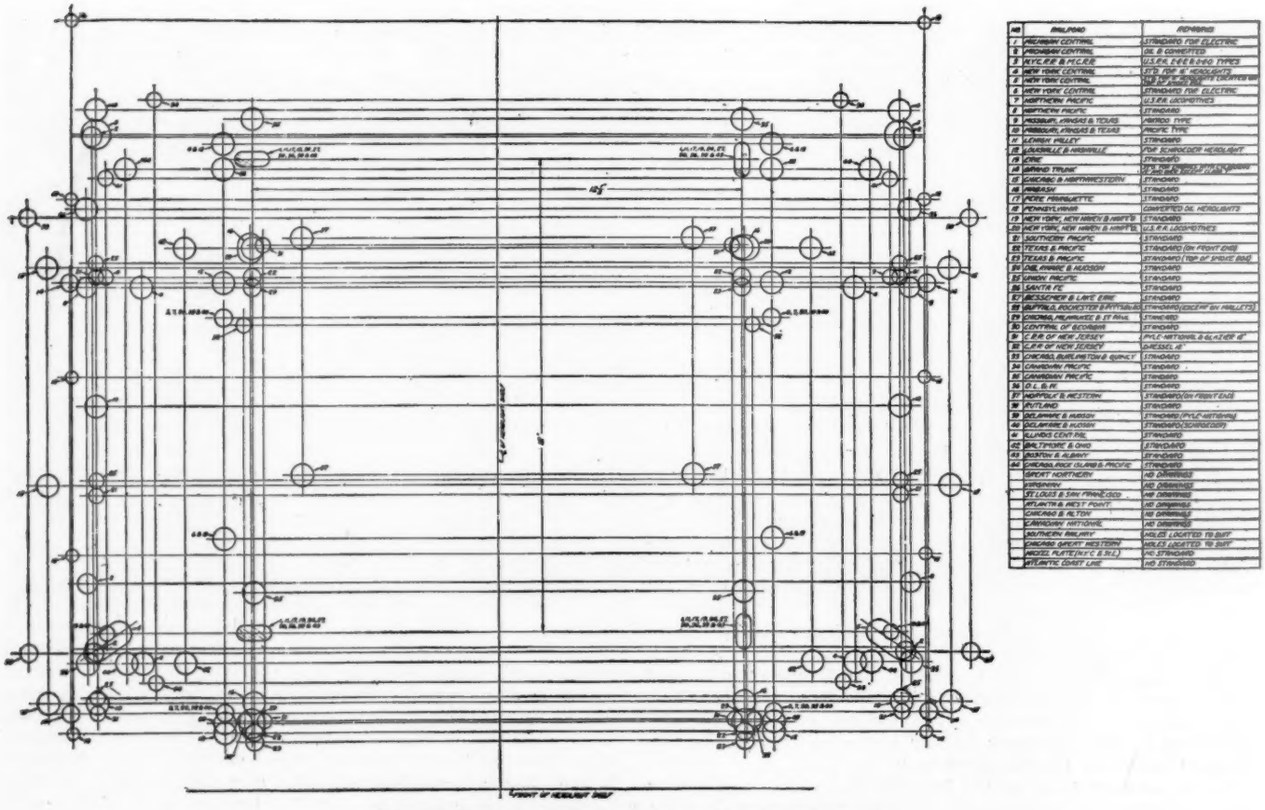


Fig. 2—Bolt Spacing for Base of Headlamp Cases

creating a tendency to discharge air through all possible outside openings and draw in air near the center of the shaft, carrying dirt with it.

Shafts of larger diameter with a higher critical speed are less liable to distortion on account of parts out of balance, and with a range of the following three sizes of ball bearings (the principal dimensions being given in inches) which the ball bearing manufacturers agreed could be expected to give satisfactory results, a greater opportunity is afforded the designer to overcome the difficulties enumerated than would be the case if he were restricted to one size of bearing.

Bearing Number	Outside Diameter (Base of Housing)	Inside Diameter (Diam. of Shaft)	Width of Roll
306	2.8347	1.1811	.748
308	3.5433	1.5748	.9055
406	3.5433	1.1811	.9055

A method of overcoming the possibility of dirt working into bearings is a problem yet to be worked out by the designers of turbo generators, and in this connection the suggestion has been made that some form of air inlet near the center of the shaft be provided in such a way that the incoming air would not pass through the bearings; also that a pressed steel disc carried by the shaft running close to a pressed steel disc carried by the housing would soon fill with grease and form an effective dirt seal.

Experience has demonstrated that oil is best for lubrication. It should be as light as possible consistent with the conditions of heat under which it operates, but not so light that there will be excessive evaporation. The best results will be obtained if the oil is filtered and kept in a covered receptacle.

The bolt spacing for base of headlamp cases, while not one of the subjects originally referred to this committee, was considered advisable to standardize if possible, and it is believed that the recommended spacing, Fig. 2, can be readily adapted to all designs. Where a railroad's standard location for headlamp is on the top or near the top of smoke box, and the recommended bolt spacing will bring the top of the headlight casing above clearance limits, the transverse spacing of bolt holes can be changed to 14 in., but as there are so few railroads where this condition exists, it was not considered necessary to cover this addition in the recommendation, it being believed advisable to leave the matter to the railroads affected to arrange with the manufacturers.

In this committee's report to the 1920 convention, reference was made to headlight reflectors that were being developed which would not require as constant attention to keep clean as is the case with the silver-plated copper reflector. A large number of such reflectors of crystal and uranium glass with silvered backs and varying in diameter from 12 in. to 18 in., the size most commonly used being 14 in., have been in service a sufficient length of time to demonstrate the permanency of their reflecting value and the small expense required to keep clean.

From information received of tests that have been conducted, there seems to be no doubt that these reflectors, used in conjunction with lamps which have been adopted as standard, will produce ample illumination to meet the requirements of the Division of Locomotive Inspection of the Interstate Commerce Commission, but in the absence of what might be termed official tests, it is not considered advisable to present any recommendations at this time.

Consideration has been given to the advisability of using cab lamps of smaller dimensions, with the idea of reducing the size of lamp cases, and the lamp manufacturers are co-operating in an endeavor to produce a satisfactory 15-watt S-14, 33-volt lamp to be used in place of the present S-17 lamp, but the development has not advanced sufficiently to warrant other than mention. The S-14 lamp is approximately 11/16-in. shorter and 3/8-in. smaller in diameter than the S-17 lamp.

A number of new and commendable styles of headlamp cases have been developed by the manufacturers since the last convention, lightness of weight coupled with durability being the dominant features, although other noteworthy refinements have been accomplished. However, the committee has not thought it advisable to consider their standardization other than with respect to the bolt spacing of the base.

There will be found at the end of this report several recommendations for maintenance practice, and while the recommendations submitted at this time are few, it is hoped that the start that has been made will eventually result in the formulation of a set of maintenance regulations which will be of assistance to the railroads in obtaining best possible results from the electric lighting equipment on locomotives.

The committee recommends that the following be submitted to letter ballot as recommended practice for future designs, and to be added to recommended practices previously adopted:

1. Turbo generators to have three feet for support and attachment to base plate, thickness of feet at bolt hole to be 3/4-in. and ribbed on sides to engage head of bolt to prevent turning; ribs to extend to body of generator to strengthen the feet, holes in feet to be 11/16-in. diameter for 5/8-in. bolts, bolts to enter from the top, with nuts on underside of base plate. Bolt hole spacing to provide for one bolt at generator end on longitudinal center line of machine 5-in. from transverse center line and two holes at turbine end on opposite sides 5 1/2-in. from longitudinal center line and 5-in. from transverse center line.

When clearance between foot and body of generator prevents entering bolt from top, foot may be slotted, but where it is necessary to slot all feet slot in foot at generator end should be parallel with longitudinal center line and slot in feet at turbine and parallel with transverse center line.

2. Steam inlet of turbo generator to be for 1/2-in. iron pipe, exhaust outlet to be for 2-in. iron pipe and drain to be for 1/2-in. iron pipe.

3. The variation in location of steam inlet from longitudinal and transverse center lines of bolt spacing and the distance above the base plate to be in increments of 1/2-in. steam inlet to be on left side facing turbine end.

4. Ball bearings to be any of the following numbers, which also designate the size:

No. 306 No. 308 No. 406

5. Brushes to be 1-in. wide, 1/2-in. thick and not less than 1 1/2-in. long.

6. Brush holders to be equipped with springs so designed that no adjustment is necessary or possible during the full life of brush and commutator, and to provide uniform pressure during 1-in. wear of brush. Brush holders to be machined inside, set 3/32-in. from commutator and at an angle of 10 deg.

7. Bolt spacing for base of headlight casings to be 12-in. by 12 1/2 in., the center line of back holes to be not more than 5 in. ahead of rear of case, bolt holes to be 7/16-in. diameter for 3/8-in. bolts, general design of casing to permit bolts to be applied from top with nuts on underside of bracket.

8. Screw sizes smaller than No. 12-28 thread not to be used, heads to be either fillister or flat and material to be brass or steel. For sizes larger than No. 12 use 1/4-in., 5/16-in., 3/8-in., etc., bolt sizes, heads of 1/4-in. and 5/16-in. bolts to be slotted to permit use of screw driver.

9. Lubrication for turbo generators to be oil.

The committee also recommends the following to be submitted to letter ballot as recommended practice for maintenance of turbo generators:

1. Oil for lubrication to be as light as possible consistent with the conditions of heat under which used, to be filtered before using and kept in a covered receptacle.

2. Oil reservoirs to be kept free from accumulation of grit and dirt.

3. Extensive repairs, and particularly repairs to rotating parts, to be done only at shops or designated points where adequate facilities are available.

The report is signed by W. H. Flynn (Chairman), Michigan Central; C. H. Rae, Louisville & Nashville; A. R. Ayers, New York, Chicago & St. Louis; H. M. Curry, Northern Pacific; J. L. Minick, Pennsylvania System; E. W. Jansen, Illinois Central; and R. W. Anderson, Chicago, Milwaukee & St. Paul.

Discussion

In the absence of the chairman, this report was read by Mr. Ayers, who said: "In connection with ball bearings I might call attention to the fact that bearings Nos. 306, 308 and 406 carry with them certain definite dimensions of the fit of the shaft in the bearing and the size of the bore in the housing. The size of the ball varies a little in different makes of bearings, so that the committee was not able to select the size of the ball that had to be covered by the shaft fit and the housing bore. By reference to the last column 'size of ball,' you will see that it works out fairly well."

During the reading of this report, Mr. Ayers further said: "I would call your particular attention to one dimension in that recommendation and that is the spacing of the two bolt holes at the turbine end. Since this report was agreed upon by the committee, it has developed that the resulting spread of bolts to eleven inches, in some cases, would be so wide that some of the boiler plate brackets now on locomotives would not take the new bolt spacing. The committee will be asked to consider changing their recommendation from 5½ in. from a longitudinal center line, to 4½ in. I think, for future designs, all of the manufacturers could meet the 9 in. dimension.

The committee thinks recommendation No. 3 is the most important of all.

C. T. Ripley (Santa Fe): I feel that the committee should be in a position to make definite recommendation as to the use of the glass reflector. These have now been in service for five years, and have proven so superior both in service and maintenance that there appears to be no reason for the application of silver reflectors—at least to new power. I do not know what is meant by official tests, but there are plenty of railroad tests which show that a glass reflector is the best now available.

As regards paragraph 5, your committee should discuss with the committee of the Railway Electrical Engineers, the question of the voltage of cab lamps. About two years ago this voltage was reduced from 34 to 33. We all know that we cannot hold the voltage of our generators constant. The change in voltage from 34 to 33 in the rating of the lamps means added life. Under the present conditions, we cannot buy 34-volt lamps. The 250-watt headlight lamp also needs attention, as a great many replacements are due to the bulbs becoming loose from the base. This can be overcome by lengthening the base, and I would like to see this new type lamp made standard.

H. B. Bohan (N. P.): I would like to concur with the gentleman's remarks on the glass reflectors. The experience of the Santa Fe has been the same as the Northern Pacific. I should also like to ask if any of the members have had any experience on the so-called illuminated dials and gages on cab lamps. We have been making quite a few experiments with illuminated gages for use in the caboose cupola and I just received a report at Atlantic City that the success of that type of gage has been uniformly good. The more we can keep off of the boiler, the better it is. If we could use an illuminated gage for the various gages in locomotive cabs, we would eliminate just so much wiring and conduits.

C. F. Giles (L. & N): I would like to call attention to the development of the air-tight headlight casting that is being worked out by one of the manufacturers. I think it is worthy of the consideration of the committee in connection with their next year's report. We have made a test of one of them in a roundhouse for six or seven months, and it appears to be very satisfactory. The idea has been developed from the experience that people have had with the air-tight headlight on automobiles. The headlight reflector does not corrode nearly as readily when air is admitted to the casing.

H. H. Bentley (C. & N. W.): I am heartily in sympathy with what Mr. Ripley said about the glass headlight reflector, but it seems to me that we ought certainly to come to some conclusion as to what size reflector we want to use. It would not only help the manufacturers, but would help everybody else, and it seems to me that we ought to conduct a test to see which is the better size reflector for all purposes; that is, either 12, 14 or 16 in., as the case may be. I would recommend that the committee be authorized and instructed to make such tests as will demonstrate conclusively the size of reflector that should be made standard.

There is one thing that our railroad copied from the Illinois Central in connection with headlights, and that is a shield over the headlight casing. I am just bringing it to your attention so that you may think about it. We heard from Mr. Bell that they were having very good results from a shield over the top of the headlight casing and the engineers were reported to be very much in favor of it. It kept the rays down and permitted them to see the signals much better than they could otherwise. We put a lot of them on our road and have now made it standard. I do not know whether any of you have seen it, but if you want a blueprint, I will be glad to furnish one. It certainly is working out very satisfactorily.

During the Railroad Administration there was some attempt made at standardization and, as I recall it, the committee at that time decided on a standard base for headlights. I am wondering how that standard conforms to or varies from the one that is now being recommended by the committee.

I am inclined to think that we ought to get away from the use of sheet steel for headlight casings. It seems to me that the development has been carried far enough so that some composition casing, which would be light in weight and not corrode, would be more satisfactory than the steel casing.

We had some trouble with the turbo-generator and it got so bad that finally we adopted a flexible connection which has apparently overcome all the trouble.

I am heartily in sympathy with recommendation No. 3 which reads: "Extensive repairs, and partciularly repairs to rotating parts, to be done only at shops or designated points where adequate facilities are available." That is the practice we have had for a good many years. Before that we were having all sorts of improper repairs made to the air pumps with many failures on the road. Taking pumps to the place where we had the proper repair facilities reduced our air pump failures. I am satisfied in the case of a little turbo-generator which a man can carry around, that it should be taken to the repair shop for repairs instead of making them on the locomotive.

W. L. Bean (N. Y., N. H. & H.): I think that for road use the 16-in. glass reflector will be found sufficient and in comparison with the silvered steel reflector, we found that after it has been out for a while the 14-in. glass reflector will give higher illumination than the old style reflector.

As to keeping the diameter of the reflector down to just what may be necessary; I believe that to be particularly important in working out a desirable cast case because the weight is so much greater as compared with sheet iron. The cost of the reflector also increases rapidly with the increase in diameter. I think it will be found that 14-in. reflectors will be sufficient for road use and 12-in. reflectors for yard use. By the adoption of cast cases, the maintenance will be negligible to what it is now, especially in such locations as on the tenders of switching engines.

Mr. Ayers: Some of the electrical people can correct me if I am mistaken about the 33-volt and 34-volt lamp but my impression is that the voltage for a locomotive lamp should be the same as the car lighting lamp. If you put in a lamp with too high a voltage rating, the car-lighting battery will not supply it to its full illuminating power.

About spacing the headlight stand, I am not able to answer Mr. Bentley's question directly. The space recommended has little to do with any other spacing for the reason that almost no two of the stands are alike. We found different combinations. Some stands have bolts with a wide spread and others with a narrow spread; what the committee had to do was to get the generator manufacturers together to see what compromise could be made

which would not interfere with the operation of the equipment.

Mr. Ripley: It is true that that particular type of lamp (15-watt lamp) is used for car platforms and a different type of lamp is recommended for use in car lighting. Why cut down the lighting of all the headlight lamps to accommodate a few lamps on platforms.

Frank J. Hill (M. C.): In answer to Mr. Ripley's remarks; I do not think there is any difference in the illuminating value of a 33- and a 34-volt lamp. If you order a 33-volt lamp you will probably get a 34-volt lamp. That is something you will have to take up with the lamp manufacturer. If you get a 33-volt lamp you get a lamp that has a range of one volt either way.

Chairman Tollerton: In this discussion we would particularly like to hear from the electricians who have charge of this equipment and especially if they are having any troubles or difficulties in maintenance of the generators or other parts of the light equipment. This committee on electric headlights is seeking information. They have asked for certain instructions from the members of the convention and they cannot work intelligently unless they get some ideas of the troubles you are having.

C. E. Brooks (Canadian National): In connection with item No. 3, I believe that about 75 per cent of shaft renewals are due to the fact that the bearings are loose and this is generally due to the fact that the internal diameter of the bearing is too small. It seems to me that the committee could well cut down the number of choices that we have in the bearing and that we could get down to a bearing such as No. 308 which has the largest internal diameter.

Mr. Ayers: In selecting a size of bearings, the committee had to be careful not to place obstruction in the way of mechanical developments. There are several combinations of bearings for supporting generator shafting: One case in which the bearing is on the extreme edge of the shaft; another where both bearings are in the center, between the turbine and armature; another where the bearing is at the generator end; and another where the bearing is at the turbine end. Where there is a bearing in the center, it has to slip over any intermediate features and then too the bearing at the outer end of the shaft would nominally have a smaller bore. I think I am correct in saying that all three of the bearings recommended are larger than those commonly in use. The committee considered particularly the inside diameter, that is, the shaft diameter; there are bearings in use today that have a considerably smaller shaft diameter than the No. 306, which is the smallest one recommended by the committee. I believe it will be found that the construction is an improvement upon the previous method.

G. P. Kempf (P. & W. V.): Has the committee made any investigation as to lowering the generator with the shaft parallel with the center line of the boiler, or at right angles to it? I believe there have been some investigations as to decreasing the maintenance cost and insuring a longer life of the generator by making some rearrangement of this kind.

Mr. Castle (N. Y., N. H. & H.): In looking over the committee's recommendation there does not seem to be any reference to the consideration of lock nuts and lock washers. I think that matter should be considered in this connection. One other item is the size of pipe of the turbo-generator. On most roads the turbo-generator is located near the source of supply at the head of the cab and the ½ in. pipe will be found adequate, but it is a question where you carry the pipe up to the headlight near the stack, or even on the deck below the smoke box, whether the size of the pipe should be increased.

The last item that I wish to mention is the ⅜-in. bolts in the headlight casing. If a smaller and more flexible casting is used it may be only a question of time when corrosion takes place and the bolts will be too small.

Chairman Tollerton: Mr. Ayers, will you state whether the committee has considered the question relative to generator location?

A. R. Ayers: There was considerable discussion about that and I think one road (Illniois Central) has made some experiments along that line. The question of the gyroscopic action was discussed; also the thrust of the bearings due to the sidewise oscillation of the locomotive but the jar on headlights, longitudinally due to a rough coupling, is probably a great deal more severe than side oscillation due to rolling. There are so many arguments on both sides of the question that the committee could not reach any conclusion. There did not seem to be any definite evidence that one method was better than another.

W. J. Bohan (N. P.): I would like to comment a little on what Mr. Giles had to say about the air-tight headlight casing. I do not believe that a headlight case could be continued on a locomotive indefinitely without developing leakage. We must not lose sight of the fact that the silvered reflector will corrode from gases which exist around a locomotive, while the glass headlight will not. One more word about Mr. Bentley's remark as to the size of the headlight casing: I do not think that that matter should be taken too seriously, either. What we want on a locomotive is a headlight case that will give us the most returns for the expenditure and the handling of the headlight case is not a very serious matter. The tendency is to charge very nearly twice as much for the lighter alloy casings and I believe we could get the straight, cast iron case down to where it will be reasonable to handle and at a very much lower price.

Mr. Ripley: The location of the turbo-generator does make a difference. It has been found in actual service that it is considerably more difficult to maintain bearings on any turbine that is located longitudinally of the boiler. Our road is one of the earliest roads to use electric headlights and we have found to our entire satisfaction that the turbo-generator should be located transversely of the boiler.

Mr. Ayers: Defective bearings are probably responsible for more turbo-generator trouble than any other one thing because, as bearings wear, the armature gets down on the field. The ball bearing manufacturers told us that the bearings already in service were capabale of higher speeds and far greater loads than anything they had to carry, which brings out the great importance of doing everything possible to keep the bearings in good shape.

I want to call your special attention to what is said about filtering the oil and keeping the oil channels clean. As time goes on and bearings with dirt shields and dust shields become more available, I believe that question should be considered. In other words, if we can keep the bearings on these machines in first-class condition, at all times, a great deal of our trouble will disappear.

The balancing of the rotating parts at the time of repair is very important. The chance is slight of being able to take off a carefully balanced turbine wheel and replace it with a turbine wheel out of stock and have that turbine wheel run at a good balance, three or four thousands revolutions per minute. In spite of this fact, I doubt if a great many people are rebalancing armatures or rotating parts after they make repairs. These are things we will have to give a great deal of attention to if we are going to keep these machines in good operating condition. (*It was voted that the report be accepted and submitted to letter ballot.*)

Chairman Tollerton: The chair regrets to announce the

death of W. C. Arp, one of our old and valued members. The death occurred at Terre Haute at 10.50 p.m., on the night of June 16. A suitable resolution will be prepared at the proper time on Mr. Arp's death.

Report of the Committee on the Manual

The best evidence of the work of this committee lies not in the formal report, but in the Manual itself. This volume, bound in loose leaf form, contains the complete mass of standards and recommended practices of the Mechanical Division, not only conveniently arranged in section groups but thoroughly cross-indexed. For the first time in the history of the Division and of its predecessors, the Master Car Builders' Association and the American Railway Master Mechanics' Association, the completed work of the organization is compiled in usable form so that it may readily be referred to as conditions require.

It is not at all improbable that much of the inertia in actually putting into effect many of the recommendations of the older associations arose from the great difficulty in determining just what were the latest developments as to standards or recommended practices on any particular subject. The loose leaf form permits the issuing of revisions with a minimum of delay.

AT THE DIRECTION of the General Committee, and with the assistance of the committees responsible for recommendations which have been adopted as Standard or Recommended Practice, your Committee on Manual has codified and published in one loose leaf volume the Standard and Recommended Practice of the Division; text and drawings. The adopted practices of the former American Railway Master Mechanics' and Master Car Builders' Associations have been carefully checked and harmonized and together with the practices since adopted by the Mechanical Division, American Railway Association, are included in this volume.

This book is designated as the Manual of Standard and Recommended Practice, Mechanical Division, American Railway Association.

For ready reference this Manual is divided into twelve Sections under the following headings:

A—Specifications for Materials.
B—Gages and Testing Devices.
C—Car Construction—Fundamentals and Details.
D—Car Construction—Trucks and Truck Details.
E—Brakes and Brake Equipment.
F—Locomotive Wheels, Tires and Miscellaneous Locomotive Standards.
G—Safety Appliances for Cars and Locomotives.
H—Train Lighting, Headlights and Classification Lamps.
I—Rules for Fuel Economy on Locomotives.
J—Inspection and Testing of Locomotive Boilers and Rules and Instructions for Inspection and Testing of Steam Locomotives and Tenders.
K—Specifications for Tank Cars.
L—Miscellaneous Standards and Recommended Practice.

Each of the Sections is provided with an index and in addition there is a complete detailed index to the entire Manual.

The Rules of Interchange and Loading Rules are not included in this Manual even though adapted as standards. They are published in separate handy form and are revised and supplemented so frequently it would not, in the opinion of your committee, be practicable to include them.

Circular No. D. V. 231, dated May 16, 1922, has been issued to the members advising as to prices, etc, for this Manual.

The report is signed by W. E. Dunham (Chairman), C. & N. W; A. R. Ayers, N. Y., C. & St. L.; W. F. Kiesel, Jr., Penn. System; A. R. Kipp, Soo Line; J. Hainen, Southern; J. T. Carroll B. & O., and J. McMullen, Erie.

Discussion

F. W. Brazier (N. Y. C.): I move the committee's report be accepted and the thanks of the association be extended to them for the splendid manner in which this manual is gotten up.

Mr. Kiesel: It should be stated that a large amount of the credit is due to our secretary, Mr. Hawthorne, who has worked very hard on this report.

(*The motion was duly seconded, put to a vote and carried.*)

Specifications and Tests for Materials

The committee submitted the following report on the subjects before it for consideration during the past year.

Sub-Committees

Sub-committees have been appointed and are now actively engaged in work on the subjects assigned.

(a) Co-operation with the Rubber Association of America on the preparation of Specifications for Mechanical Rubber Goods.
(b) Specifications for Welding Wire.
(c) Specifications for Water Gage and Lubricator Glasses.
(d) Revision of present specifications for Galvanized Sheets.
(e) Revision of specifications for Structural Steel.

SUBJECTS REFERRED TO THE COMMITTEE BY THE GENERAL COMMITTEE

(a) *Heat Treated Axles and Crank Pins. Has the process of heat-treatment decreased the number of failures to any appreciable extent?*

The committee felt that it did not have sufficient information among its members to satisfactorily answer this question and therefore requested the secretary of the association to circularize all members to secure the expression of opinion from those who have been using heat treated steel.

This circular was sent out and the original replies received have been tabulated in the following summary:

Total number of replies received, 77.
Number reporting no information, 52.

Of the remaining 25, four report that they consider heat treated axles and crank pins more satisfactory than untreated. Nine report that they are using heat treated material, but are doubtful as to the value of the heat treatment. Five report that they prefer annealed steel rather than the heat treated. Six report that their

experience with heat treated material has been unsatisfactory. One road reports that they consider heat treated axles satisfactory, but are using annealed steel for piston rods.

In some of the replies it is pointed out that a possible reason for some of the difficulties experienced with heat treated steel was due to an improper heat treatment and that it was possible that the same material, if properly heat treated, would have given satisfactory results. In some quarters there is a strong opinion that the best steel for locomotive forgings is that which has been given a proper annealing treatment to thoroughly refine the grain and relieve all stresses.

(b) *Revision of Specifications for Lumber, if such revision is needed. Representatives of the Purchases and Stores Division to be requested to co-operate with the Committee on Specifications and Tests.*

No action has been taken on this subject. The committee has not received any replies to the questions asked of the members in its report of 1921 regarding the value of the present lumber specifications and requesting suggestions for revision. This subject will be continued on the docket for future action.

Co-operation With the American Society for Testing Materials on the Subject of Specifications for Steel Castings for Railroads

The Committee has had representatives serving with representatives of the American Society for Testing Materials on the Joint Committee on Specifications for Steel Castings for Railroads, which has been working for the past two years and which held a final meeting on March 24, 1922, and approved proposed specifications for submission by each of the representatives to their parent bodies.

The A. S. T. M. representatives have submitted their report to Committee A-1 on Steel, which has approved the specifications to be included in their report to the society in June, 1922, as a proposed tentative specification to be published in their proceedings in order that it may be available for comment and criticism.

The committee's representatives have made their report transmitting the proposed specifications to the secretary of the association. The committee feels that the specifications proposed by the joint committee are the best that have so far been produced and that they cover grades of cast steel suitable for all railroad purposes. The committee would unhesitatingly recommend these specifications to go to letter ballot of the association as Recommended Practice in place of both the tentative specifications for steel castings submitted with their report of 1921, and the present standard specifications for steel castings, were it not for the fact that the Car Construction Committee and the Coupler Committee were also represented o nthe Joint Steel Castings Committee, and there has been no time for joint consideration of the specifications by these committees. In view of this condition the specifications are included in this report (Exhibit A) for information only.

Comment and criticism of these specifications are requested from members of the association so that final action may be taken on them in the report for 1923.

Recommendations

Revision of Standard Specifications

Air Brake and Train Air Signal Hose. In order to take care of the provision of Rule 57 of the Rules of Interchange, it is recommended that Section 15, Label, be revised to permit the use of a rectangular label in addition to the band label, the wording of the paragraph to be as follows:

"15. Label. Each length of hose shall have vulcanized on it a label of red rubber, as shown in Fig. 2. This label shall be applied on the hose at a point 6 in. from the end (a variation of ½ in. either way will be permitted) and with the top of the lettering toward the center of the hose. The use of a rectangular label in addition to the band label is optical with any railroad, providing space, preferably 2 in., is allowed between the two labels."

The committee also submitted exhibits containing revisions of numerous recommended practice specifications and new specifications as shown below. These exhibits are voluminous and because of their specialized character, they are not reproduced here.

Revision of Recommended Practice Specifications

(a) Specifications for Turpentine.

(b) Specifications for Oxide of Iron Paste.

(c) Specifications for Black Paint.

(d) Specifications for Raw Linseed Oil.

(e) Specifications for Boiled Linseed Oil.

(f) Specifications for Red Lead.

New Recommended Practice Specifications

(a) Specifications for Mineral Spirits.

(b) Specifications for Red Lead and Oil.

(c) Specifications for Extended Red Lead Paste Paint.

The Committee recommended that the above revisions and new specifications be submitted to letter ballot of the association.

The report is signed by F. M. Waring (Chairman), Pennsylvania System; J. R. Onderdonk, Baltimore & Ohio; Frank Zeleny, Chicago, Burlington & Quincy; A. H. Fetters, Union Pacific; H. G. Burnham, Northern Pacific; J. C. Ramage, Southern Railway; J. H. Gibboney, Norfolk & Western; H. P. Hass, New York, New Haven & Hartford; T. D. Sedwick, Chicago, Rock Island & Pacific; G. N. Prentiss, Chicago, Milwaukee & St. Paul; G. E. Doke, New York Central and H. D. Browne, Engineer Tests, Chicago & Northwestern.

Of the large number of subjects covered in the report, probably the most important is the specification prepared by the Joint Committee on Steel Castings for Railroads. The specification has still to be submitted to the membership of the American Society for Testing Materials and, as noted in the report, has not yet been considered jointly with the other mechanical division committees interested. The advantage of a single specification with one chemical content for all railroad steel castings is apparent, from the standpoint of the manufacturers as well as the railroads.

The question of revising the lumber specifications is also an important matter although no action has yet been taken. Some of the lumber associations have advocated more elastic grading rules claiming that the present requirements throw a large part of the log into the lower grades and increase the cost of supplying the quality of lumber which the railroads demand. It may be advisable to consider whether the disadvantages of slightly lower grade lumber would offset the reduction in the cost that might be effected.

PROPOSED STANDARD SPECIFICATIONS FOR CARBON STEEL CASTINGS FOR RAILROADS

As Agreed Upon by

THE JOINT COMMITTEE ON STEEL CASTINGS FOR RAILROADS AT ITS MEETING HELD AT PHILADELPHIA, FRIDAY, MARCH 24, 1922.

1. **Scope.**—(a) These specifications cover all carbon steel castings for locomotive and car equipment, and for miscellaneous use, classified as Grade A and Grade B.

(b) Grade A castings shall be furnished annealed unless otherwise specified by the purchaser.

Grade B castings shall be furnished annealed.

(c) The purposes for which the two grades are generally used are:

Grade A, unannealed, covers only such special castings as may be approved by the purchaser. Grade A, annealed, covers such castings not covered by Grade A, unannealed.

Grade B, covers all castings for high stresses, such as truck side frames, bolsters, couplers and coupler parts, locomotive frames and locomotive drivin. and trailer wheel centers.

I. MANUFACTURE

2. **Process.**—The steel may be made by one or more of the following processes: open hearth, electric furnace, crucible or side blow converter.

3. **Annealing.**—(a) Castings shall be allowed to become cool. They shall then be uniformly heated to the proper temperature to refine the grain and allowed to cool uniformly.

(b) **Annealing Lugs.**—For the purpose of determining the quality of annealing at least two and not more than four annealing lugs shall be cast on all castings 150 lb. and over and on such castings less than 150 lb. as required by the purchaser or his representative. The location of the annealing lugs shall be such that when removed by the inspector they shall be indicative of the character of annealing. The standard annealing lug shall be 1 in. in height and 1 in. width and ⅝ in. thickness where it joins the casting.

(c) If, in the opinion of the inspector, a casting is not properly annealed, he may at his option require the casting to be reannealed.

II. CHEMICAL PROPERTIES AND TESTS

4. **Chemical Composition.**—The steel shall conform to the following requirements as to chemical composition:

	Grade A.	Grade B.
Manganese, not over.....	.85 per cent	.85 per cent
Phosphorus, not over....	.05 per cent	.05 per cent
Sulphur, not over.....	.05 per cent	.05 per cent

5. **Ladle Analyses.**—An analysis of each melt of steel shall be made by the manufacturer to determine the percentage of carbon, manganese, phosphorus, sulphur and silicon. This analysis shall be made from drillings taken at least ¼ in. beneath the surface of a test ingot obtained during the pouring of the melt. The chemical composition thus determined shall be reported to the purchaser or his representative when requested, and shall conform to the requirements specified in Section 4.

6. **Check Analyses.**—An analysis may be made by the purchaser from the broken tension test specimen or from a casting representing each melt. The chemical composition thus determined shall conform to the requirements specified in Section 4. Drillings for analysis shall be taken not less than ¼ in. beneath the surface, and shall be taken in such a manner as not to impair the usefulness of a casting.

III. PHYSICAL PROPERTIES AND TESTS

7. **Tension Tests.**—(a) The steel shall conform to the following minimum requirements as to tensile properties:

	Grade A. Unannealed.	Grade A. Annealed.	Grade B. Annealed.
Yield Point, lbs. per sq. in.....	29,250 lb.	29,250 lb.	36,000 lb.
Elongation in 2 in. per cent.....	1,450,000	1,600,000	1,600,000
	Tens. Str.	Tens. Str.	Tens. Str.
Elongation not under.....	22 per cent.	24 per cent.	22 per cent.
Reduction of Area, per cent.....	2,250,000	2,600,000	2,500,000
	Tens. Str.	Tens. Str.	Tens. Str.
Reduction of Area not under.....	30 per cent.	35 per cent.	30 per cent.

(b) The tensile strength shall be reported as information.

(c) The yield point shall be determined by the drop of the beam or by the dividers, the method being optional with the purchaser, and at a crosshead speed not to exceed ⅛ in. per minute. The tensile strength shall be determined at a speed not to exceed 1½ in. per minute.

8. **Test Specimens.**—(a) A sufficient number of test coupons, from which the required test specimen may be prepared, shall be cast attached in the neighborhood of each end of each locomotive frame, attached to each locomotive cylinder, to each wheel center, and to miscellaneous castings weighing over 150 lbs. These test coupons shall remain attached to the castings throughout the annealing and until the castings are presented for inspection. If the design of the casting is such that the test coupons cannot be attached they shall be cast in runners outside of the casting, but attached to it to represent each melt. The location of the test coupons, as well as the method of casting such coupons, shall be subject to mutual agreement by the inspector and the manufacturer. In the case of any orders for castings weighing under 150 lbs., the physical properties as required in Section 7 may be determined from an extra or spare test bar cast with and attached to some other casting from the same melt.

(b) When sufficient coupons have not been cast, a test specimen may be cut from a finished casting at a location mutually agreed upon by the inspector and the manufacturer.

(c) Tension test specimens shall conform to dimensions shown in Fig. 1. The ends shall be not less than ⅞ in. in diameter and of a length and form to fit the holders of the test machine in such a manner that the load will be axial.

A. S. T. M. Standard Test Specimen
A. R. A. Standard Test Specimen

These are alike except diameter, which is: A. S. T. M. 0.5 in., A. R. A. 0.505 in.

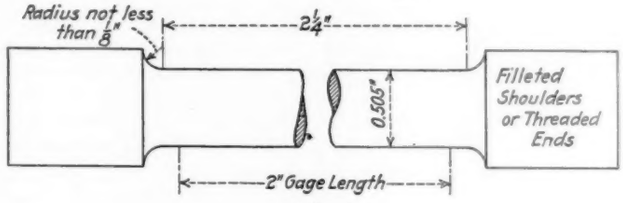


Fig. 1

9. **Number of Tests.**—(a) General Requirements. (1) One tensile test shall be made from the neighborhood of each end of each locomotive frame and both tests shall meet the requirements of the specifications. One tensile test may be made from each wheel center and each locomotive cylinder castings, but at least one of each kind of such castings in each melt shall be tested. For miscellaneous castings from melts which do not include frames, wheel centers or cylinders, one tensile test shall be made from each melt, except as provided in Section 9B-1.

(2) If the test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(3) If the percentage of elongation of any tension test specimen is less than that specified in Section 7 and any part of the fracture is more than ¾ in. from the center of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

(4) If the results of the physical test lot do not conform to the requirements specified, the manufacturer may re-anneal such lots, but not more than twice, and retest shall be made as specified in Section 7.

(5) No part of this specification shall operate to cause any one tensile test to apply to more than 40 tons of castings as offered for inspection.

(b) Special Requirements for Miscellaneous Castings.

(1) After 15 consecutive melts, which may contain any or all classes of castings (except frames, wheel centers and cylinders) covered by these specifications on one or more orders have been tested and accepted in accordance with the above requirements, the manufacturer may group the succeeding melts in lots of five melts each, but each lot not to exceed 40 tons, the entire group to be accepted if the test specimen selected from the lot fulfills the chemical and physical requirements herein specified. If this test fails, a rehearing will be granted on the melt that the failed

bar represents, and the other four melts of the group shall be tested individually.

(2) If there is a period of more than six months between shipments of the class of castings covered by these specifications, then each melt shall be tested individually until 15 consecutive melts have been accepted, after which the melts may again be grouped as in paragraph 9b-1.

(3) If one or more melts are rejected, each succeeding melt shall be tested individually until 15 consecutive melts have been accepted, after which melts may again be grouped as in paragraph 9b-1.

(4) In case of small orders for bolsters, truck sides, draft arms, yokes or castings weighing over 150 lbs., where the size of the order and the available pattern and foundry equipment are such that not more than five castings can be cast in any one melt, the physical properties, as required in Section 7, will be determined from an extra or space test coupon cast with and attached to some other casting of the same melt.

10. **Alternative Tests to Destruction.**—In the case of orders including only castings not exceeding 150 lbs. in weight, the test to destruction of one casting from each 100 castings or smaller lot may be substituted for the tension tests at the option of the inspector. This test shall show the material to be ductile, free from injurious defects and suitable for the purpose intended.

IV. Workmanship and Finish

11. **Workmanship.**—(a) All castings shall substantially conform to the size and shape shown on purchaser's drawings, and shall be made in a workmanlike manner.

(b) The castings shall be free from injurious defects.

(c) Minor defects which do not impair the strength of the castings may be welded by an approved process with the approval of the inspector. The defects shall first be cleaned out to a solid metal, and after welding the castings shall be annealed, if required by the inspector.

V. Marking

12. **Marking.**—The manufacturer's name or identification mark and the specified pattern number shall be cast on all castings. In addition the month and year when made shall be cast on all bolsters, truck sides, frames, wheel centers, cylinders and similar castings. The location and size of numbers shall be agreed upon by the manufacturer and the inspector. In accordance with the standard practice of the individual foundry to identify individual castings, a serial number may be cast or the melt number may be stamped on bolsters, truck sides, frames, wheel centers, cylinders and similar castings as agreed upon by the manufacturer and the inspector. The melt number shall be legibly stamped in all other castings weighing over 150 lbs.

VI. Inspection and Rejection

13. **Inspection.**—The inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed to all parts of the manufacturer's works which concern the manufacture of castings ordered. The manufacturer shall afford the inspector, free of charge, all reasonable facilities to satisfy him that the castings are being furnished in accordance with these specifications. Unless otherwise specified, all tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment.

14. **Rejection.**—(a) Unless otherwise specified, any rejection based on tests made in accordance with Section 6 shall be reported within five working days from the receipt of samples.

(b) Castings which show injurious defects subsequent to their acceptance at the manufacturer's works will be rejected and the manufacturer shall be notified.

15. **Rehearing.**—Samples tested in accordance with Section 6, which represents rejected castings, shall be preserved for two weeks from the rate of test report. In case of dissatisfaction with the results of tests, the manufacturer may make claim for rehearing within that time.

Discussion

Mr. Ayers: Would it be practicable to have the letter ballot, in the case of these specifications, state briefly what the change was in the proposed specification from the old specification, and why that change was proposed?

Mr. Waring: That will be taken care of in the letter ballet in the usual way, by printing the old specification along with the proposed revision, so that direct comparisons can be made.

Mr. Ayers: That takes a good deal of time and, to a person who has not made a study of the subject, the reason for the change is oftentimes not known. I was wondering whether it would not perhaps save some printing and clarify the subject, if the letter ballot should be confined particularly to the change from the old specification and that change was made.

Mr. Waring: There is no doubt that would be excellent information and if it meets with the approval of the members and they will authorize the committee to prepare that statement, we will be glad to do it.

Mr. Ayers: I make a motion that the committee be instructed to do that in submitting their report to letter ballot.

(*The motion was duly seconded and carried.*)

H. F. Bentley (C. & N. W.): I notice that the Rubber Association is co-operating with the committee in regard to specifications and I was wondering why the American Welding Society should not be called upon to do the same in working up specifications for welding wire. I had occasion to talk before some of the members of the American Welding Society the other day and brought up the question of specifications for welding wire. I would suggest that they be asked to co-operate with this Association.

A large number of driving axle failures have probably been charged up to the kind of steel in the axle. We were having so much trouble that we made a careful study and found, by etching the broken parts, an original check had been made in the bearing of the axle by a pointed, diamond-shaped tool. Subsequent operations on this bearing, consisting of rolling the bearing to a smooth finish, had covered up those grooves made by the pointed tool and to all appearance we had an excellent finish. We had the assistance of Dr. Howard, engineer physicist of the Interstate Commerce Commission who proved to us conclusively that the initial start of the fractures on the majority of these axles was not due to the quality of the steel but to the impression left by a sharp-pointed tool in the roughing cut.

E. E. Chapman (Santa Fe): With regard to the effect of sharp tools in causing fractures, we have found by a great many investigations that failures are directly chargeable to this cause rather than to defective material. Also on certain classes of engines we find that it is a question of the life of the axles. When they become from seven to nine years old, we have a good many failures.

G. W. Rink (C. of N. J.): The question of heat treated axles and crank pins has not been fully settled yet. We recently had 25 heavy Mikado locomotives built with heat treated axles, crank pins and so forth, and I was much surprised to learn that those engaged in doing the heat treating did not recommend heat treated material for that purpose. They predicted all kinds of calamities, stating that in the very near future, we would have broken axles. Personally, I am a believer in open hearth steel thoroughly annealed but this time we strayed from the beaten path and thought we would get something a little better. As I stated before, however, the people who were doing the heat treating did not think as much of heat treated steel for axles and crank pins as they did of the annealed steel.

Several of these axles broke during the hammer test and fractured clean through, similar to a chrome vanadium shaft that I saw on a big hoisting engine some years

ago. This hoisting engine had a 17-in. shaft which was in service only about six months when it failed through the center. This shaft was made of chrome vanadium steel, but a 40-point carbon shaft, put in to replace it has been running for the last ten years without any signs of deterioration. I presume that is right in line with the argument that sooner or later we will experience trouble with these axles.

W. F. Kiesel: We have used a large number of heat-treated axles, crank pins, and other parts, and naturally, made a study to find where the difficulties lie. Segregating is very bad, and, as indicated before, if you have a nick or a sharp corner or anything of that kind you are almost certain to start a detailed fracture, but if your chemistry is right, you have no segregation. If you are careful to have nearly uniform sections with large radii at shoulders, the heat treated axle does very well and gives you the benefit of heat treatment. I remember one case where we had axles with the radius between the wheel seat and the body of the axle not clearly defined on the chart. Some of the radii seemed about ¼-in. and fractures started at these points. After we increased the radius to an inch and a half the fractures ceased. Furthermore it is a good thing to be sure that all segregation is eliminated by drilling a hole through the center of the axle, or a crank pin whichever it may be. This will show if there are any internal checks, rolling imperfections, or checks in the billet, which will be accentuated by heat treatment.

Mr. Brazier: I would like to digress a little, if I might, from the report. There is nothing on a railroad that gives as much trouble today as bursting of airhose. You cannot judge a man's physical condition by the clothes he has on; he may have a very poor heart covered up with a nice suit of clothes. Neither can you judge the airhose by its outward appearance. Years ago we used to have a label showing the dates of application so as to give an idea how long hose had been in service. I have endeavored through the committee and through the secretary to have this question brought up because there are quite a number of railroad officials who think that we should have a time limit on hose. A hose that has been in service four or five years, deteriorates. When you put on the air pressure, you do not know what minute the hose will burst. We have a rule on our railroad that we take from passenger service all airbrake hose after it has ben in service one year. It is then put in freight service. (our rules used to be for two or three years) and finally scrapped. We dare not run the risk of longer service, but today I do not know how we are going to tell how long a hose has been in service, or what its condition is unless we go back to the use of a label, showing the date of application. Personally I can see no harm in going back to the old way of putting on the dates of application so you will have something to go by in judging how long an airhose has been in service.

Chairman Tollerton: I would like particularly to hear from the engineers of tests. They are vitally interested in these discussions. After specifications are adopted and after the work of this committee has finally received the approval of the railroads we do not want engineers of tests to tell the purchasing departments that the specifications are no good. If you have any criticisms now is the time to discuss them and we would like to hear from every one.

Mr. Fuller: I do not know of any subject that is more important today than the subject of steel. My friend Brazier got off on hose. I think steel is more important.

We are using heat treated chrome vanadium and other grades of steel. We are buying the best that the steel makers can make and we are having more trouble today than we had with iron. It seems to me that the steel makers should at least give the purchasers of steel some information as to how their steel should be handled. You buy billets in cold weather and in warm weather take them in the blacksmith's shop and work them, you get indifferent results. The manufacturers will tell you that you should not work certain steel until the frost is taken out of it—after you have had your trouble. Now, if it is true that certain alloys of steel cannot be stored outdoors in cold weather and should not be put in the blacksmith's shop furnace or fire without certain "decent" treatment as they call it, I think we should have the information. We are having, and so are other roads having, an epidemic of broken crank pins. We thought a goodly amount of it was due to punishment in the shop in turning the pins out and leaving toolmarks, but we found some that showed no indication of tool marks.

It seems to me that this Association, with the help of the steelmakers, can help the railroads and each other if what can be done with certain kinds of heat treated steel is made plain.

If we have any steel representatives here I would like to hear from them. We have a condition right now of billets that look like an oak plank, split on the ends and on the side with cracks 1½ in. in depth. They were not split when shipped because no steel maker would ship a carload of billets with the ends checked. I think that the steel maker should come to our rescue and tell us what we can do with their steel.

C. E. Chambers (C. of N. J.): Mr. Fuller is placing the steelmakers in a very embarrassing position. I will tell you how I would handle that matter if I had any trouble in regard to steel. I would get in touch with the manufacturer who made the steel and thresh it out with him. He might be more willing to talk across a desk than to get up and discuss the matter before the convention.

Mr. Fuller: I want to apologize to the steelmakers if I have been taken wrongly. I appreciate that the steelmakers are doing, possibly, all they can. We could take this matter up with them and see if some change could be made so that these conditions would be avoided. However, I still believe that if the steelmakers were here, they could tell us of certain abuses to be avoided in handling steel.

G. W. Rink (C. of N. J.): I would like to have an expression from the convention as to what is considered the best metal for Walschart valve gear links, wrought iron case hardened, or mild steel case hardened. No doubt some of our members have had experience with both metals and I would like to know what the percentages of failures are with the various kinds of metal.

Prof. Endsley (University of Pittsburgh): With regard to some comments by Mr. Brazier, I will say that some tests were run a few years ago at Purdue University which partly demonstrated, at least, that the age of the hose was worth more than its appearance in determining whether it was a good hose or not. Of course there were some exceptions to the rule in these tests, but the general average of the tests was in favor of the age of the hose determining its condition.

In regard to tool marks left in the rough turned axle, either from a sharp tool or a torn place due to a heavy cut, these can never be rolled out. Any rolling of the metal causes a compression longitudinally in the axle and this longitudinal compression causes a tension on the bottom of any of these checks, increasing the possibility of failure at that point.

In some vibratory tests which I have conducted, I found that a mere scratch upon the polished surface will influence the life in vibrating this metal. In reversal of stress,

and that is what an axle is subject to, these imperfections, whether rolled out or not, are bound to produce failures.

With regard to co-operation between the steel maker and the users of steel, I am confident, that this should be close. They should co-operate; the manufacturers should tell the temperature at which a given steel should be worked and the users should follow these instructions closely. It is a known fact that the temperature at which steel is worked has a large bearing upon the service which will be obtained.

Mr Waring: The standard label does show the date when the hose was made so that the age of the hose can be determined from the label.

The date of application, however, is not given.

Your committee will be glad to act on the suggestion that was made to co-operate, if possible, with the American Welding Society in connection with the specifications for welding wire.

Your committee also wanted to call attention to the fact that in presenting these specifications for paints, and paint materials your committee is of the same opinion that such specifications should not be standardized. They should be presented as recommended practice because conditions vary in different parts of the country on different railroads and it is nearly always necessary for the individual railroad to prepare specifications for paint. These specifications are submitted merely as a guide and recommended practice.

Your committee wishes you particularly to give careful attention to the proposed specifications for carbon steel castings for railroad use and the committee would be glad to have any comments or criticisms on these specifications sent in as soon as you can after the convention.

T. H. Goodnow (C. & N. W.): I wish to refer to the committee's report where they refer to a "revision of specifications for lumber" in connection with which they are apparently undecided as to whether any action is necessary at this time. I believe that the specifications need revision and my opinion is based on the recent experiences we have had in trying to harmonize the grade wording under the present specifications with the various lumber associations. If the committee does undertake the revision of the lumber specifications in connection with representatives of the purchases and stores department, I feel that there should be co-operation through some channel of the A. R. A. and the various lumber interests to bring about these revisions. In this way the wording of the grading that is used in our specifications will be such that we can buy lumber and buy it intelligently. At the same time there will not be this constant question arising as to what the wording means. No. 1 may mean one thing in the northern part of the country and may mean another thing in another section.

With regard to Mr. Brazier's remarks about the label, age is not to be depended upon entirely for the removal of rubber hose. Some very careful investigations and tests were made some years ago, showing that after all, you have to decide upon the removal of hose from its appearance at the time it is being inspected.

The secretary calls attention to the fact that at the time the badge was changed the Train Brake and Signal Committee set up the soap suds test to be used as the determining factor in the removal of hose.

Mr. Fuller: I do not want to do all the talking, but Mr. Goodnow, I think, is absolutely correct when he says that the specification for lumber should be worked out with the lumber dealer. We find it is almost impossible to buy lumber under car specifications, due to the fact that the lumber associations keep changing their grade of lumber. That is especially true on the western coast and there is no use in our getting up a set of specifications and then, when we want to buy lumber, we cannot buy it without paying exorbitant prices. I think it will save time and help the railroads more if we will co-operate with the lumber associations in making up the specifications for lumber.

Chairman Tollerton: The secretary advises that Mr. Hoover, secretary of the Department of Commerce, is working with the American Railway Association along the lines suggested by Mr. Fuller and Mr. Goodnow.

Before calling for action on the committee's report, there is a motion before you, made by Mr. Ayers and duly seconded, that in sending out the letter ballot for the approval of the report, the changes made in the report be printed and issued with the letter ballot. Are you ready for the question?

(*The question was duly put to a vote and carried.*)

Chairman Tollerton: A motion is in order that the report be accepted, and the recommendations contained in the report submitted to letter ballot.

(*This motion was duly put and carried.*)

C. E. Chambers: The committee would like to submit for the approval of the Convention, the following telegram:

"Atlantic City, June 19, 1922.

Mrs. W. C. Arp,
Terre Haute, Indiana.

Word just received of death of Mr. Arp. Master Car Builders and Master Mechanics Division of American Railway Association in convention here extend to you their deepest sympathy in your sad bereavement.

W. J. Tollerton, Chairman,
Mechanical Division."

Mr. Fuller: I move that the message be sent.

(*Motion seconded and carried.*)

Mr. Chambers: The Committee on Resolutions will offer a resolution that the subject of wheels be reopened, as the particular part of the subject which we have in view is vital in the locomotive question. Also the further use of steel wheels when removed from engines in local service to be applied to yard service engines in order to get maximum wear before scrapping should be discussed.

O. C. Cromwell (B. & O.): The committee made a report last week relative to reducing the limited wear on steel tires for yard service. As you know now, the limit of wear is ¼ in. above the limit of the rail groove. That ordinarily gives 1⅛ in. of metal between the spread and the nearest point of the critical line. That limit was established quite a number of years ago before we had much experience in the performance of rolled steel wheels. It was predicated largely upon experience gained through the use of steel tired wheels.

Many improvements have been made in railroad steel wheels and I think your present cuts show that you have a thickness of 1⅜ in. on rolled steel wheels as against 1⅛ in. on wheels with a straight bore. That figure was originally established because there was not a definite knowledge as to the inside contour under the rim, but we have established a standard section of tread and that has been used for some time. Your committee has had before it for some time the question of reducing this limit, bringing it down to 1⅛ in for tenders in switching service.

Prior to these limits being incorporated in the I. C. C. rules some roads had had experience in running wheels in light service and found it could be done with safety. The committee would like to present this matter now to the association and would like to have some discussion as to the point of reducing that wear on tender wheels in switching service.

Chairman Tollerton: I do not believe there was any second to the motion.

Mr. Giles: I will second it.

(*The motion was put and carried.*)

H. C. Oviatt (N. Y. N. H. & H.): It does seem to me this is a question which ought to be given considerable thought before any final action is taken. The possibility and danger of getting such wheels mixed up and applied to the wrong class of equipment seems to me important. Where wheels of that description are turned down for switching service they are liable to get under passenger equipment, which might be dangerous. I want to inject that thought before any final action may be taken.

Mr. Giles: I will state for the benefit of Mr. Oviatt and the members of the association that this has been our practice for eight or ten years and we have had no trouble in keeping the wheels apart and we do not get them mixed. It is a perfectly feasible proposition.

Mr. Ripley: In further answer to Mr. Oviatt's question, I wish to state that the committee felt that the switching service should be used for the test inasmuch as it would be possible to observe the results more readily than in road service, as well as there being less chance of accident in case of flange failure. The switching engines operate over sharper curves and if there is any tendency to flange weakness it should develop in this service.

There is another feature in regard to comparing the scrapping limits of steel tired wheels and forged steel wheels not mentioned in the former discussion. That is the fact that the steel tires are shrunk on the center which means an initial strain tending to increase breakage. The best metal in the rolled steel wheel is that on the inside of the rim, as the pressure of the rolls comes directly at this point.

Mr. Chambers: I think that this is a vital question. Every railroad man is constantly being advised to adopt every means of bringing about economical operation. That is something that must be considered and if we can put a used wheel on some locomotive tender in the yard and get a year or eighteen months of additional service out of it we are not justified in scrapping it.

Mr. Giles: It appears to me that the secretary in calling attention to the consideration that was given this matter by the General Committee, should refer to the understanding that the committee had with Mr. Pack that the question would not be discussed at this meeting of the association.

Mr. Chambers: I might say that on our road for years, we put some of these wheels which had reached the limit for heavier passenger car service, in lighter passenger service and never had any accidents.

Mr. Ripley: I may mention that your committee wishes to be conservative on this entire question. They first ran laboratory tests and next studied flange failures. Both of these indicated distinct possibilities of reducing the scrapping limit on all railroad steel wheels they would first reduce the limit on switch engines in order to get a service test. They feel and hope that this test will prove beyond question that the limit can be reduced on all wheels. The railroads will then be able to make a great saving.

A. G. Pack (Chief Inspector, Bureau of Locomotive Inspection, I. C. C.): I do not know whether it is permissible for me to make any remarks on this matter, but I want to say that I have a very high regard for the opinions of this organization as an association and am perfectly willing to go along with this Association in its recommended and standard practices. I am also ready to meet and discuss matters with your representatives. I am, however, very much averse to adopting any standards in switching service and also road service wherein the parts are not easily interchangeable.

Again, I believe that stresses on the flanges in yard service are equally as great, if not greater, due to rough track and heavy curves and many turn-outs, frogs, etc., than on road locomotives.

In comparing the locomotives on the railroads in the United States—more than 70,000—I find that it is practically impossible now to keep many of them legally within the requirements of the rules and I fear very seriously that if you adopt a standard for switching locomotives it will be put into use in connection with the road service. If it is an unsafe practice in road service that would certainly compel the Bureau of Locomotive Inspection to take action we are not desirous of taking; that is, in enforcing the punitive side of the law.

If after due consideration by this Association, you are willing to go on record in your usual careful way and say that the reduction of the metal on the forged steel wheel is perfectly safe, I will go along with you, but I do not want you to ask me to agree to something where life and limb is at stake and there is property that may be damaged. We find 3/8 in. of lateral motion on cross-heads and 1/4 in. of vertical motion. We have looked into many of these cases and that is our experience. I have no doubt you will admit that is too much. On the ground of safety to the public, of course, you will give this subject very careful consideration and I want to assure you again I am willing to go as far as this organization, as such, is willing to recommend. (On motion the subject was closed.)

(*After the election of officers, noted elsewhere, the meeting adjourned.*)

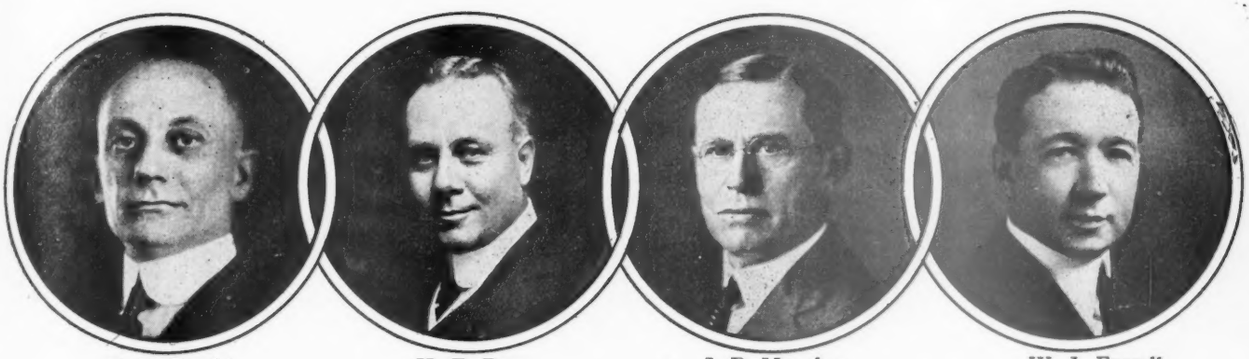
Chairman Tollerton on the Work of the Mechanical Division

CHAIRMAN TOLLERTON, in turning the meeting over to his successor yesterday, made the following comments:

"In turning over the gavel to my worthy successor, probably a few words based on observations I have made in the two years I have had the honor of presiding over this organization may not be out of the way. I offer them merely as a suggestion.

The heads of the car and locomotive departments come to these conventions for the benefits they receive from the discussions in the convention and the education from the exhibits. I have tried to encourage a free discussion of the papers to the best of my ability, particularly by the younger men of the Association. I am afraid that their failure to discuss the papers is due to the fact that they may think that the older officials know more about the subjects under discussion than they do, and they hesitate to enter the discussions. We appreciate that these younger men will be the older railroad officials in a few years from now, and therefore I would like to offer this suggestion to the motive power representatives here—that in future conventions when they send their staffs to the convention, that they charge them with familiarizing themselves with some of the subjects coming up for discussion.

These reports of the committees are invariably in the hands of the members from a month to six weeks ahead of the convention. You can all familiarize yourselves with the committee reports in that time, and the younger men can think of what they are going to say, and if they desire they can write it down if necessary. I would like to see very much more activity in the discussions by the younger members, because it is on their shoulders that the burden of carrying on the activities of this Association for years to come will fall. I want to thank you one and all for the assistance and the help you have always given me.



F. D. Reed
Vice-Chairman

H. E. Ray
Chairman

J. P. Murphy
Secretary

W. J. Farrell
Assistant Secretary

American Railroad Assn.—Section VI—Purchases and Stores

Inspiring Address by Elisha Lee; Reports on Stores Department Book of Rules and Classification of Material

CHAIRMAN H. B. RAY called the meeting to order at 9:15 a.m.

A letter of regret was read from R. H. Aishton, president of the American Railway Association, who was unable to attend the convention, and from W. G. Besler, president of the Central Railroad of New Jersey, who is vice-president of the American Railway Association and the member of the executive committee assigned to advise with Division VI.

The following committees were appointed:

Resolutions: J. H. Wallace, W. H. Deal, and J. A. Deary.

Memorials: H. A. Anderson, C. H. Thomas of the Southern Pacific, and J. A. Stewart of the N. Y. O. & W.

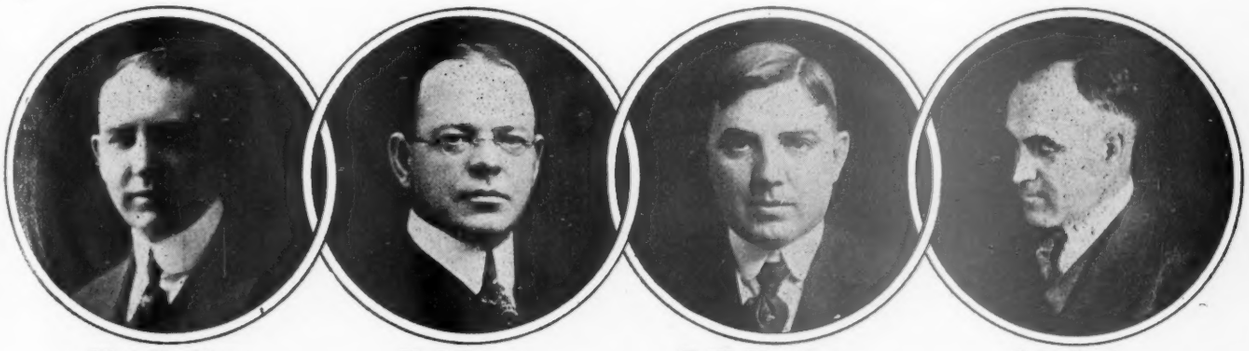
Address by Elisha Lee

Chairman Ray: There are many of us who have had the pleasure and the value of Mr. Lee's personal acquaintance, and those who have not been so lucky have known him by reputation—what he has done as a railroad builder and operator. So it is going to be like listening to an old friend, and one who talks a language we can understand.

I cannot refrain from recalling at this time the first time I ever heard of Mr. Lee. It was not so many years ago, either, and I confess it with some embarrassment; but it was in the dark days of railroading, when it was difficult to foresee what was going to happen to the railroads. Along with a lot of other small fry I was in a certain office waiting for instructions from our superiors as to what to do under certain contingencies. We began to receive telegrams indicating that the entire matter was in the hands of Elisha Lee. He was in Washington carrying all of the burden of the railroads in the country and trying to bring order out of chaotic conditions and was thus holding my job and your job. As the matter progressed I could see in some small way at that distance just how ably the matter had been handled and I said "Surely I would like to see that man." But I never had the opportunity then. However, when we came to choosing a man to come here and talk to us, I felt I would like to have him. I take great pleasure in introducing Elisha Lee, vice-president of the Pennsylvania.

Elisha Lee: The work of Division VI since it started, has been watched by your officers from the highest down and I want to bring to you a word of congratulation and thanks for the work that you have done. In these days, you know, when a railroad man talks, he talks or should talk with a reasonable amount of discretion and I have found it of great help in keeping myself straight and not making remarks that were not intended, to stick pretty close to my notes.

Since receiving the highly appreciative invitation which brought me here today I have supplemented my previous general knowledge of the subject of purchasing and stores by reading a little more fully of the activities of that branch of a railroad which you represent. I can



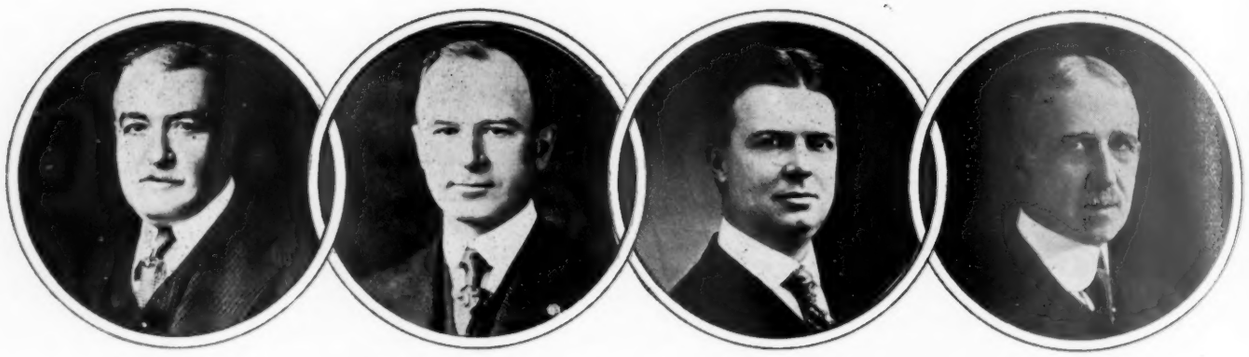
W. A Hopkins

H. C. Pearce

E. W. Thornley

S. B. Curtis

Members of General Committee, Div. VI., Purchases and Stores, A. R. A.



E. N. Bender E. A. Bushnell H. H. Laughton W. G. Phelps

Members of General Committee, Div. VI., Purchases and Stores, A. R. A.

say with the greatest sincerity, I have been deeply impressed. Statistics and figures of railroad purchasing read like the budget of a world power. They are truly stupendous and give a vivid idea of the immensity of the great enterprise in which we are all engaged. Normally, the railroads of America buy and consume about two billion dollars' worth of supplies annually, which exceeds the prewar cost of running our National Government. Current supplies on hand for all our railroads as shown in their reports to the Interstate Commerce Commission, represent upward of $800,000,000 worth of property, the economical buying, time of delivery, and safekeeping of which are your particular duties and functions. These are, indeed, great responsibilities.

The general purchasing agent of the Pennsylvania, Samuel Porcher, recently analyzed the elements of ideal purchasing and stores work. Briefly he defined them to be first to obtain the right kind and quality of material for the specific purpose desired; second, to supply it at the right place, namely, where it is needed; third, to have it there at the right time when it is needed; fourth, to furnish it in the proper quantity; fifth, to have it accurately counted and receipted for; sixth, to have it properly stored and protected; seventh, to buy it for the least expenditure of money. What I wish to do, having brought Mr. Porcher's carefully thought-out definition to your attention, is to leave with you some further thoughts from the viewpoint of the executive officer responsible for the general results of operation.

In my position on the railroad as vice-president in charge of the Eastern Region, official responsibility embraces both the rendering of service satisfactory to the people and the production for the company's corporate purposes of a proper amount of net revenue. That net revenue, to be satisfactory, must be sufficient to meet my regional share of rentals and charges, the dividend upon our stock and a proper margin for surplus. The purchasing and stores work of the Eastern Region and of the system as a whole has an important bearing upon the discharge of that responsibility. Railroading is a public service. We all realize that fact and must keep it constantly before our eyes, but it is also a business carried on for the production of reasonable profits and the earning of a fair return upon invested capital.

In 1920 this country had the greatest boom in its history; in 1921 we had a smash that in its way was quite as spectacular. Thousands of mercantile and other business concerns went to the wall, and I venture to say that in at least 95 per cent of the cases the real trouble was some error in business judgment and management, namely, too big an inventory. Some of our railroads, too, were caught in 1921 with extremely undigested stocks of supplies. Therefore, I would say, from the viewpoint of the executive management responsible for general results, there is no more important duty resting upon the purchasing and stores officer of any railroad than that of keeping down stocks of all kinds to a minimum consistent with meeting proper and reasonable demands.

This necessity is threefold; first, to minimize the amount of capital at risk in stores; second, to reduce the interest loss on the idle capital; third, to keep the company in a position to cope promptly with changes in markets or general business conditions without incurring serious loss.

There may from time to time be a tendency on the part of officers in other departments than yours to order supplies without due consideration for the risk and waste in unnecessarily high stocks. This is not surprising, because quite often readily available supplies of material, which can be drawn on at any time that may be momentarily convenient, save a great deal of trouble to the man on the ground; sometimes it saves a great deal of hard thinking and planning. It then becomes your function and un-

J. G. Stuart W. A. Summerhays E. J. McVeigh U. K. Hall

Members of General Committee, Div. VI., Purchases and Stores, A. R. A. (S. B. Wight missing)

doubted duty to step in and prevent such action and put back the responsibility for properly planning for the work of other departments where it belongs. Your responsibility, when further considered, is that of trustee for the public. Our railroads, in the truest and best sense, are owned by the people, both through the wide dissemination of stocks and bonds in the hands of individual holders and through that still broader distribution of ownership which is brought about by the widespread holding of these securities on the part of the great fiduciary institutions of the people, notably the banks, savings funds, and insurance companies, in whose welfare and safety practically every citizen is directly or indirectly interested. We have in this way a genuine public ownership of the railroads in our country; that is, ownership by the public, a far better thing than ownership by the government, which in the end means by and for politics.

From the viewpoint of executive management it is helpful and clarifying to consider the materials and supplies of a railroad system as so much money in the process of being converted into transportation or facilities for service. Fuel and water are manufactured directly into service. Most other supplies go into facilities. Therefore, try to visualize to yourself the fact that what you are handling is money all the time, and couple this thought with the fundamental principle of business, that money should not ever be kept idle longer than is absolutely necessary. Therefore, other things being equal, the smaller the stocks that are carried and the shorter the time the material remains on hand, the better is the quality of the purchasing and stores work.

Let us consider just what this means. On our road as a whole, supplies on hand at any given time may be said to amount in value from $60,000,000 upward. I am not prepared to express an opinion as to just what may be considered, an allowable maximum figure, that doubtless varies from time to time according to circumstances, but often the minimum of $60,000,000 is equal to two years' dividends on our stock at our old rate of six per cent. A day's interest on that sum is $10,000, enough to pay the wages of 2,000 or more men. The interest on the cost of material stocks of all railroads in the country would pay the wages of between 25,000 and 30,000 men. This item of inventory represents a large portion of our working capital and should be kept as nearly fluid as circumstances will permit, for the greater the turnover or the smaller working capital required to finance a year's purchases. There is of course, a word of caution due. If stocks are brought down too low, a point will be reached at which savings in the purchasing and stores work will begin to be overbalanced by added cost elsewhere, through inability to obtain material with reasonable promptness.

Besides your responsibility from the viewpoint of efficient operation, the influence of your work upon the prosperity of your country as a whole must not be forgotten. Railroads are the principal consumers of products of some of our most important basic industries, taking one-third or more of the country's steel production, some 30 per cent of its actual output. The list of articles, commodities and materials regularly bought by our purchasing department which is typical of the railroads in general, numbers about 200,000 separate items. Indeed there is scarcely any branch of production in which the railroads are not important consumers. Active buying by the railroads has always been one of the chief factors leading up to every period of prosperity which our country has experienced.

Perhaps you might be interested in a brief outline of the general organization of conducting purchasing and stores work for our system. Our organization is comparatively new, a little over two years old, and has had time to be tested. We have what we call a regional plan of operation. At system headquarters in Philadelphia, we have our staff of general executive and administrative officers with broad jurisdiction and responsibilities under the board of directors, for the production of results throughout the system as a whole and for the guidance of general policies in all departments. For the carrying out of the actual detail work of operation the system has been divided territorially into four regions, eastern, central, northwestern and southwestern with headquarters respectively at Philadelphia, Pittsburgh, Chicago and St. Louis. Each region is in charge of a vice-president generally responsible for the work of all departments in his territory. Regional vice-presidents are provided with staff officers, heading the various departments in the regions corresponding to the departmental organization of the systems administrative staff at Phladelphia. The latter may be likened in a military organization to the general headquarters of the Army, and the region to the sectors in which the actual work is subdivided for campaign purposes. The G. H. G. devises general plans and policies and secondly the regional staffs carry them out.

At Philadelphia we have two system officers, a general purchasing agent and a general supervisor of stores; each heading his own department and seperately responsible for results, through working in the closest harmony with each other. Both report to the same system executive vice-president in charge of real estate purchases and stores.

In each region there are a purchasing agent and general storekeeper responsible to the regional vice-president for the performance of their duties and at the same time in constant touch with the general purchasing agent and general supervisor of stores for guidance as to policies and co-ordination of purchasing and stores work in all regions. Our Altoona Works, located at Altoona and Juniata, are also treated as a separate entity under the Chief of Motive Power, distinct from any of the four regions, with its own supply force.

We feel that our plan of organization of the purchasing and stores work provides that degree of decentralization of authority and responsibility which is so highly desirable in a large, complex business like our own, while at the same time, true co-operation between the region and general supervision exercised at system headquarters in Philadelphia, guard against such errors as competition between the regions for delivery, or inadvertant bidding against each other. The arrangement also gives us a valuable mechanism for distributing supplies between the four regions and the subdivisions, and provides a means for quickly equalizing conditions of surplus or scarcity which may arise at given points.

I am, indeed, happy to have had this opportunity of meeting so many officers of the stores and purchasing department of our great American railroads. The railroad management of the country think enough of the men in your branch of the service to trust you with the custody of not far from a billion dollars' worth of property, with an actual spending in active times of twice that sum. That is a pretty good guarantee of character for the men in charge of these very important departments of railroading. I wish to express to you my sincere thanks and appreciation for the honor which you have given me in permitting me to address you.

Chairman Ray: Mr. Lee, I wish I could adequately express my personal appreciation for your courtesy in coming here and giving us this wonderful talk. I know in doing so I voice the sentiments of all who have listened. Mr. Lee has told us what I think we all will appreciate

and that is the importance to railroad operation that purchases and stores bears to the general result, and it is our hope in this three-day session, which we propose to devote to real hard work, we will profit and go better prepared to handle business than we have been heretofore. I think that w ought to have a rising vote of thanks for Mr. Lee, and if agreeable, I wish you would all rise.

Chairman Ray: I want to congratulate Mr. Farrell and the various committees for the good work they have done this year. The percentage of attendance at the committee meetings was greater than ever before, and as a consequence the reports are exceptionally valuable.

Division VI is not so constituted that these reports are to be considered mandatory; they are recommendatory entirely, and should be handled and discussed as such.

Necessarily this discussion will bring out the real benefit which we are to derive, but that does not lessen the value of the reports.

Report of General Committee

The General Committee reviewed briefly the action taken since the meeting in June, 1921, which pertained mostly to the programs for 1921 and 1922. Practically all the reports approved by the Division at the business meeting in 1921 were approved in their entirety by the American Railway Association at its annual meeting. Objection was raised to the recommendation made in the report on material accounting that all material stocks should be carried in the accounts of the stores department, as it was felt that some roads would prefer to have a separate accounting department. The Accounting Committee has included a further recommendation on this question in this year's report.

The Committee on Committees thought it advisable to extend the scope of the committee on Subject 4, Material Accounting, to include mechanical facilities; also Subject 15, Buildings and Structures, to include facilities. The committees on Subject 6, Cross-Ties, and Subject 13, Lumber, have been combined into one under Subject 13, the title of which has been changed to Forest Products.

IN ACCORDANCE WITH instructions from R. H. Aishton, president of the association, a meeting of all chairmen and secretaries of the various divisions and sections was held at New York on January 31, 1922. The purpose of the Advisory Council is to consider the elimination of duplication of effort among the various divisions and sections and ascertain in what subjects there may be contact, and a remedy for the situation.

The chairman and secretary attended this conference, and information is being compiled for submission at the next meeting of the Council. The chairman has appointed H. C. Pearce to represent Division VI—Purchases and Stores, on the Advisory Council.

In accordance with Section 4 (g) of the Rules of Order, the General Committee offers the names of the following members as candidates for the Committee on Nominations during the ensuing year:

F. A. Bushnell, Purchasing Agent, Great Northern Railway Co., St. Paul, Minn.

J. G. Stuart, General Storekeeper, Chicago, Burlington and Quincy Railroad, Chicago, Ill.

W. C. Bower, Assistant Manager, Purchases and Stores, New York Central Lines, New York City.

H. P. McQuilkin, General Storekeeper, Baltimore and Ohio Railroad, Baltimore, Md.

G. A. Secor, General Storekeeper, Chicago and Alton Railroad, Bloomington, Ill.

The report is signed by H. E. Ray (chairman), Atchison, Topeka & Santa Fe; F. D. Reed (vice-chairman), Chicago, Rock Island & Pacific; J. P. Murphy, New York Central; E. N. Bender, Canadian Pacific; F. A. Bushnell, Great Northern; H. H. Laughton, Southern Railway; W. G. Phelps, Pennsylvania System; J. G. Stuart, Chicago, Burlington & Quincy; W. A. Summerhays, Illinois Central; U. K. Hall, Union Pacific; W. A. Hopkins, Missouri Pacific; S. B. Wight, New York Central; E. J. McVeigh, Grand Trunk; H. C. Pearce, Chesapeake & Ohio; E. W. Thornley, Baltimore & Ohio, and D. C. Curtis, Chicago, Milwaukee & St. Paul.

(*The report was adopted as read.*)

Stores Department Book of Rules

YOUR COMMITTEE RESPECTFULLY submits the following report:

A questionnaire, as follows, was prepared and sent to the member railroads, from which 61 replies were received:

(1) Use of a net ton of 2,000 lb. in all transactions.

(2) Discontinue the use of dozen and gross in quotations and calculations, basing the quantities on ten or multiples of ten.

(3) Visible card system: What experience have you had in ordering material, receiving material, or in keeping a stock record by use of the visible card system? Stock book: Please submit samples of your stock records in use in the general storekeeper's office, general storehouse and local storehouses.

(4) Use of the metric system of weights and measures in place of the present system.

Net Ton

To the question of the desirability of the use of the net ton of 2,000 lb. in all transactions, 55 of 61 replies indicate as agreeable to the adoption. The committee points out the fact that the standard scrap classification calls for the use of the net ton as the basis of reporting and sales of scrap, whereas certain commodities, such as rails, fuel, etc., are requisitioned and purchased, and accounted for upon a gross ton basis of 2,240 lb. requiring adjustment of carrying or disbursing charges in the stores accounts.

Therefore, we recommend for favorable consideration of the proper division of the American Railway Association, that as the tariffs are revised, they be based upon the net ton of 2,000 lb. on all commodities purchased by the ton.

Unit of Dozen and Gross

To the question as to the discontinuance of the use of dozens and gross in quotations and calculations, basing the quantities on (10) or multiples of ten, the replies were 43 favorable and 18 unfavorable.

The committee is investigating this matter further in connection with the National Association of Purchasing Agents with a view of bringing about the use of ten or multiples of ten instead of dozen or gross.

The report brings up two important questions that affect all departments; the use of the metric system and of the net ton in all transactions. Closely related to these is another topic, the discontinuance of the dozen and gross as units and basing all quantities on multiples of ten.

There are many active advocates of the metric system in this country and bills which seek to make this system compulsory are continually being introduced in Congress. Some people believe that the most satisfactory results would be obtained with a compromise system of weights and measures, using a decimal system, but based on a new unit related to the English units. As for instance, 40 in., which would be approximately the same as the meter.

It is interesting to note that while the proposal to use units of 10 is in accordance with metric practice, the net ton of 2,000 lb. is a move away from that system, the metric ton being approximately the same as the long ton, while pro-metric agitation in this country does not seem likely to succeed for some time, the railroads will be directly affected by any action that is taken regarding weights and measures, and it is a good thing to have the question brought before the association occasionally to determine the sentiment among the members.

Visible Card System

To the question as to what experience members of the association have had with the use of the visible card systems for stock records, replies were received from 60 railroads, of which 11 were "yes," and 49 reported no experience.

The expressions received from the railroads on this question would seem to strongly endorse the use of a stock book, rather than the use of a stock card.

The canvass of the railroads using the stock books develops that out of 57 replies received, 29 are using the A. R. A. standard stock record, or the standard stock record with slight modifications, and 28 using stock books other than American Railway Association.

The committee wishes to further emphasize the importance of the stock book and recommends the use of the American Railway Association stock book, which by reason of its simplicity can be adopted either in detail, or with slight modifications, to meet practically every condition in securing accurate knowledge of the stocks of material on hand.

Metric System

To the question with reference to the use of the metric system of weights and measures, replies from 61 railroads were received, of which 8 were favorable, 12 favorable if the system were adopted by the U. S. Government, and 41 opposed.

The committee would not recommend any definite action on this question at this time, but would suggest that inasmuch as the question of the use of the metric system of weights and measures in place of our present system is under consideration by a number of manufacturing and commercial organizations, and if approved by the United States Government, the members of the division give consideration to the question in order that they may be prepared to intelligently discuss the matter if any future action is deemed desirable.

Comparison of Stocks

It has come to the attention of the committee that there is no means of comparing the amount of stock on hand, or the cost of operation of the stores department of one road with another, and it is recommended that a special committee be appointed to investigate and report on this subject.

The report is signed by J. W. Gerber, (Chairman), Southern Railway; W. E. Brady, Atchison, Topeka and Santa Fe; F. N. Dobbs, Southern Pacific; C. J. Irwin, Gulf, Colorado and Santa Fe; R. D. Long, Chicago, Burlington and Quincy; H. P. McQuilkin, Baltimore and Ohio; W. S. Morehead, Illinois Central; C. D. Young, Pennsylvania System; J. G. Stuart (Chairman Ex-Officio), Chicago, Burlington and Quincy.

Discussion

J. W. Gerber, chairman of the committee, who presented the report, stated that the committee realized that the adoption of the short ton—2,000 lb.—will require some time. It is out of date to have two tons, one at 2,240 lb. and the other at 2,000. The same annoyance arises when you consider the dozen and gross. Many quotations are based on these units; many of the articles are billed singly and packed singly instead of by dozens or grosses. The same is true of 100. Again, while railroads might buy by the dozen or by the gross, yet they never issue the material in that form. Requisitions from foremen are always for 10, 50, 20 or 1. As to the metric system, he believed the division should also take some decided action in the way of education.

J. G. Stuart, of the C. B. & Q., stated his experience was directly opposite to that of Mr. Gerber. He found too many orders using the dozen. The C. B. & Q. has gone a long way as suggested in the matter of prices. Generally speaking, the road is trying to get away from the dozen and gross units.

A. W. Munster (Boston & Maine) suggested that this matter be taken up through the Hardware Manufacturers' Committee as it is mostly in hardware that the dozen and gross are encountered.

W. A. Hopkins, of the Missouri Pacific, considered changing to multiples of 10 as satisfactory but advocated that the consideration of the metric system be left to the engineering and mechanical departments.

H. C. Pearce (C. & Q.) stated that he felt there is no reason whatever why railroads should not adopt 2000 lb. as a ton. As regards the units of dozen and gross the purchasing officer has only to make his contracts on the basis of 100. In the matter of the metric system, Mr. Pearce was not in favor of making any changes. He thought the question of the list discount arrangement is more important and should be taken up. Would like to see this committee instructed to investigate thoroughly the discontinuance of the list and discount method of price determination.

T. J. Frier (Wabash) thought the division should be a little slow about doing away with the dozen and the gross and that it would be well to go to the American Iron and Steel Institute and pursuade them to co-operate in getting the 2,000-lb. ton adopted.

N. M. Rice (N. Y. N. H. & H.) stated that the use of the dozen and gross is a long established commercial practice. He did not believe the division should interfere.

F. D. Reed (C. R. I. & P.) expressed the opinion that the 2,000-lb. ton should be used as the unit and that that part of the committee's report should be accepted and adopted as Recommended Practice of Section VI. As to the dozen and gross, he thought that part of the report should be continued and the committee continued for an-

other year. With reference to the visible card system, he believed the division should adopt that section of the report and recommend as Standard Practice the use on all railroads of a standard stock book of the type which has been in use on many railroads and was adopted as Recommended Practice by the Railroad Administration. As to the metric system, he felt the division should not do anything until the government comes out in favor of the metric system. Mr. Reed moved that the report of the committee be accepted and the committee continued with instructions to follow up with the National Association of Credit Men and other national organizations the question of units, dozens and gross. The motion of Mr. Reed was adopted.

Committee on Classification of Material

The report of the committee includes a complete revision of the standard material classification which lists practically every article used in all the departments of the railroads, and is so voluminous that it cannot be reproduced in full. The standard store department classification is in use on a very large number of roads, and for that reason changes in the system require the most careful consideration.

The principal change has been the elimination of the main or departmental subdivisions, thus permitting each material to be placed in a single class, irrespective of where it is used. Many additions have been made to the classification, and with the very complete index it should be more useful than ever before.

Over 4,000 items are included in the classification, which gives some indication of the amount of work involved in the revision which the committee has made. It is a big job well done, and reflects credit on the men who carried it out and on the Purchases and Stores Division.

THE need for revision of the material classification to meet modern conditions is recognized. Many changes have been made in standards and additions of units to maintenance and operating materials not contemplated in the original report.

Replies to a canvass made indicated a general opinion that the work should be done at this time. Consideration was also given to the fact that there is a demand for a large number of copies, and that the original is now out of print.

In making the report—reclassifying and adding to the original, as indicated by asterisks in the detail—the committee was guided to a considerable extent by recommendations received from various members of the association.

The elimination of the four grand headings, indicating the kind of operation or maintenance for which the material classes listed thereunder were used, was for the purpose of providing a better arrangement. The following changes in classification are recommended by the committee:

PRESENT CLASS	PROPOSED CHANGE
Class No.	Class No.
1-A. Frogs, switches and crossings, and parts of same.	1-A. No change.
1-B. Track fastenings, track bolts, spikes, etc.	1-B. No change.
1-C. Track tools, all kinds, miscellaneous track material and wire fencing.	1-C. Track *and roadway* tools, all kinds, miscellaneous track material and wire fencing.
1-D. Motor, hand, push and velocipede cars, and parts of same.	1-D. No change.
2-A. Interlocking and signal material.	2-A. No change.
2-B. Telegraph and telephone material.	2-B. No change.
3. Building and paving brick, cement, lime, stone, cast-iron water and culvert pipe, roofing tile and slate, prepared roofing, all kinds, for buildings, sewer and drain tile, etc.	3. No change.
4-A. Bridge ties.	
4-B. Lumber, bridge and building, piling posts, shingles, and manufactured lumber for bridges and buildings.	4. Lumber, bridge and building, piling, posts, *bridge ties,* shingles, and manufactured lumber for bridges and buildings.
5-A. Switch ties, treated or untreated.	5-A. No change.
5-B. Cross ties, treated.	5-B. No change.
5-C. Cross ties, untreated.	5-C. No change.
6. Iron bridges, turntables and structural steel, all kinds.	6. No change.
7. Ballast, all kinds, including rip-rap.	7. No change.
8-A. Rail, new.	8-A. No change.
8-B. Rail, second hand, except scrap.	8-B. No change.
9-A. Fuel and water station material, and scales and parts.	9-A. No change.
9-B. Elevators, and coal and ore handling and conveying machinery.	9-B. No change.
9-C. Steam derricks, steam shovels, steam ditchers, pile drivers and other such portable equipment used in roadway work and special material for same.	9-C. No change.
10. Chemicals for timber treatment.	10. No change.
11. Bolts, nuts, washers, rivets, lag screws, pins and studs.	11. No change.
12. Springs, helical and elliptical, all kinds, for locomotives and cars.	12. No change.
13-A. Flues for locomotive and stationary boilers, arch tubes, dry pipes, all kinds.	13-A. Flues or tubes for locomotive and stationary boilers, dry pipes, all kinds, superheater material and firebox syphons.
13-B. Arch brick for locomotives.	13-B. No change.
14. Brass, copper, and steel tubing, copper ferrules, soft metals in bars, pigs or sheets.	14. No change.
15. Bar iron and steel, spring steel, tool steel, shaped steel, chain, except light coil, wire netting and sheet steel under 13 gauge.	15. Bar iron and steel, spring steel, tool steel, steel shapes, sheet iron and steel under 3/16", wire netting and chain, except light coil.
16. Boiler, firebox, tank and sheet steel, No. 13 gauge and heavier, all kinds.	16. Boiler, firebox, tank and sheet iron and steel 3/16" and heavier, all kinds.
17. Heavy forgings for locomotives, such as crank pins, piston rods, quadrants and levers, motion links, valve yokes, etc.	17. Forgings and pressed steel parts for locomotives, such as crank pins, piston rods, quadrants and levers, motion links, valve yolks, pressed steel grate side bars, front ends, cylinder and steam chest casing, etc.

PRESENT CLASS	PROPOSED CHANGE
Class No.	Class No.
18. Car forgings, iron and steel, for passenger and freight cars.	18. Car forgings, iron and steel, and fabricated or shaped steel, for passenger and freight cars.
19. Locomotive castings, including gray iron, malleable and steel, rough and finished; also cylinders, rough and finished.	19. Locomotive castings, including gray iron, malleable and steel, rough and finished; also cylinders and driving wheel centers, rough and finished.
20. Car castings, including gray iron, malleable and steel, all kinds, brake beams and parts, couplers and parts, metal bolsters, side frames and metal car roofs.	20. No change.
21. Rough and finished brass castings and journal bearings.	21. No change.
22. Air brake material, all kinds, for locomotives, passenger and freight cars, except hose, but including air pump and parts.	22. Air brake material, all kinds, for locomotives, passenger and freight cars.
23. Mechanical appliances for locomotives, such as injectors, lubricators, bell ringers, sanders, pop valves, air and steam gauges, whistles, boiler checks and parts, water gauge and lubricator glasses, and speed recorders.	23-A. Standard mechanical appliances for locomotives, such as injectors, lubricators, bell ringers, sanders, pop valves, air and steam gauges, whistles, boiler checks and parts, water gauge and lubricator glasses, and speed recorders. 23-B. Special mechanical appliances for locomotives, such as stokers, power reverse, patented valve gear, coal pushers, boosters, feed water heaters.
24. Passenger car trimmings, all kinds, including oil and gas lamps and fixtures, steam heat fixtures and fittings, except steam hose, mail car, coach and chair car seat fixtures, including upholstering material of all kinds, such as carpet, linoleum, rubber tiling and matting for cars and buildings.	24. Passenger car trimmings, all kinds, including oil and gas lamps and fixtures, steam heat fixtures and fittings, mail car, coach and chair car fixtures, including upholstering material of all kinds, such as carpet, linoleum, rubber tiling and matting for cars and buildings.
25. Electric material for electric and steam locomotives.	25-A. Electric material peculiar to electric locomotives. 25-B. Electric material peculiar to steam locomotives.
26. Electric material peculiar to steam and traction line cars.	25-C. Electric material peculiar to steam and traction line cars.
49. Power plant equipment, including steam and electric power plants and generating stations, motors, and other electrical equipment for operating shop machinery.	25-D. Electric material for power plant equipment and generating stationary motors, and other electric equipment for operating shop machinery. (See Class 49.)
44. Electric lighting material and supplies for buildings and grounds.	25-E. Electric material and supplies not included in Classes 25-A, 25-B, 25-C, 25-D and 26.
26. Electrical material for steam and traction line cars.	26. Material peculiar to gasoline and electric passenger motor cars, automobiles, auto trucks, tractors, power trucks, etc.
27. Shop fuel, smithing coal, coke, fuel oil for furnaces, gasoline, charcoal, etc.	27. No change.
28. Foundry supplies, fire brick, fire clay, etc.	28. No change.
29. Wheels, tires and axles for locomotives and cars, including driving wheel centers, cast iron, steel tired and rolled steel wheels.	29. Wheels, cast iron, steel tired and rolled steel, tires and axles, for locomotives and cars.
30. Lumber, locomotive and car, rough and finished, including manufactured articles.	30. No change.
31. Machinery and machine tools, including all power driven shop machinery.	31. Machinery and repair parts, including all power driven shop machinery.
32. Locomotive boilers, fire boxes, locomotive tenders and frames.	32. No change.
33. Trucks for equipment, locomotives and cars.	33. No change.
34. Material in process of manufacture.	34. No change.
35. Floating equipment material, all special material peculiar to floating equipment.	35. No change.
36-A. Locomotive, train and station supplies, including tinware, all kinds; lanterns, train, switch, and other signal lamps and parts; locomotive and caboose tool equipment, such as jacks, shovels, wrecking frogs, train chains, etc.; baggage and warehouse trucks, caboose and station stoves and parts, ticket cases, tool handles, and all kinds of woodenware.	36-A. Locomotive, train and station supplies, including tinware, all kinds; lanterns, train, switch, and other signal lamps and parts; locomotive and caboose tool equipment, such as shovels, wrecking frogs, train chains, etc., baggage and warehouse truck, caboose and station stoves and parts, ticket cases, and all kinds of woodenware.
36-B. Grain doors, grain and coal door lumber, and coopering material for grain and flour cars.	36-B. No change.
37. Oil house material, all kinds, including lubricating oils and grease, illuminating oils, boiler compound, all kinds, and waste, all kinds.	37. No change.
38. Ice, sawdust, hay and straw for ice houses.	38. No change.
39. Fuel, locomotive, including coal and wood and fuel oil for locomotive use only.	39. No change.
40. Fuel for stations and cars; includes coal, coke and wood.	40. Fuel for stations, cars, *ferries and power plants;* includes coke and wood.
41. Commissary supplies for dining cars and restaurants.	41. No change.
42. Pipe, iron and steel, except boiler flues.	42. Pipe, iron and steel, and fittings, all kinds, for steam, air and water, valves and cocks for same.
43. Pipe fittings, all kinds, for steam, air and water; valves and cocks for same.	43. (Blank—consolidated into Class No. 42.)
44. Electric lighting material and supplies for buildings and grounds.	44. (Blank—see Class No. 25-D.)
45. Hardware, all kinds, including nails, jacks, small hand tools, emery wheels, wire and wire cloth.	45-A. Hardware, all kinds, including nails. 45-B. Hand and small machine tools, such as drills, taps, reamers, dies, chasers, including air tools and parts.
46. Rubber and leather goods, including air, steam and water hose, packing, all kinds, including metallic packing, asbestos, rope, belting, pipe covering and boiler lagging.	46. Rubber and leather goods, includng air, steam and water hose, all kinds, fibrous packing, asbestos, rope, belting, pipe covering and boiler lagging.
47. Glass, drugs, chemicals and painters' supplies, such as brushes, scrapers sand and emery paper and cloth; also paints, oil and varnishes; all kinds, for equipment and buildings.	47. No change.
48. Stationery and printing.	48. No change.
49. Power plant equipment including steam and electric power plants and generating stations, motors, and other electrical equipment for operating shop machinery.	49. Power plant equipment other than electric materials. (See Class 25-D for Electric Material.)
50. Scrap, all kinds, including scrap rail.	50. No change.

The report is signed by W. D. Stokes (Chairman), Illinois Central; J. E. Byron, Boston & Maine; E. Harty, Southern Pacific; E. H. Hughes, Kansas City Southern; W. L. Hunker, Chicago, Rock Island & Pacific; C. W. Kinnear, Pennsylvania System (Northwest Region); C. D. Longsdorf, New York Central; G. T. Richards, Chicago, Milwaukee & St. Paul; D. W. Roberts, Pere Marquette; C. L. Wright, Missouri, Kansas &

Texas; and U. K. Hall (Chairman Ex-Officio), Union Pacific System, Omaha, Neb.

Discussion

C. D. Young (Penna): We have a classification built on 15 or 20 years practice, but we have watched the A. R. A. classification with interest. With the present tendency to go into steel equipment, I would suggest to the committee a closer survey of their classification as proposed in 15, 16, 17 and 18. These four classifications on a road having a large percentage of steel equipment, still represents a very large investment in money. Practically all of the motive power money is tied up in these four accounts, and with the classification as worded here, it is impossible to carry out the proposed practice of the A. R. A., namely to know how much money you have in stock as between the locomotive and freight equipment. I suggest that consideration be given to splitting numbers 15 and 16 so that it is possible to identify the raw material from which you are to make classifications 17 and 18.

I believe Classification No. 15 could be clarified. The material in No. 15 is designated as "steel shapes," meaning the unfabricated material such as channels, I-beams, etc. "Steelshapes" does not clearly indicate that this includes the steel as it comes from the mill.

Mr. Hall: The committee believes that sooner or later the Interstate Commerce Commission will prescribe and require material classification, as they did with the operating classification and it is thought that all roads could use this classification.

The report of the previous committee had been acted on by the Railway Accounting Officers' Association. It had been adopted by this association as recommended practice, and by the Railway Accounting Officers' Association and if the Interstate Commerce Commission ever attempts to prescribe a classification, it is believed that they would give its careful attention to a classification which had been recommended by the two representative bodies dealing with this subject.

It was the idea of the committee that this report would bring about a revision that would make a practical accounting proposition, and a practical physical proposition. We all feel our stock books should be lined up with our accounting classification. I believe that this convention should appoint a committee to confer with the Railway Accounting Officers' Association, presenting to them the revised classification, the reasons therefor, and endeavor to have them accept the revision, so that we would then present a united front to the Interstate Commerce Commission in submitting a good and practicable and workable classification.

There is no snap judgment in this report. It was considered at various times from all angles and there are roads that are today waiting and expecting to change to the adopted classification when they feel it is stable enough to warrant them doing so. It is regrettable that a classification has to be changed. It involves a lot of labor and expense, and the committee feel that the classification prescribed here would meet the views of future committees.

Mr. Curtis (C. M. & St. P.): This classification is a good workable classification. I have worked under four or five classifications, and I have never yet seen a classification someone could not find fault with. This classification, made and adopted by the Association and which the Milwaukee is using, is a good, workable plan. I feel that this committee has made wonderful progress in the recommendations they have made. We must either go forward or backward. We cannot afford always to copy the same classification. In regard to the four major headings, I do not see why any railroad should not use them if they want them. All they have to do is to draw their totals under each existing sub-division and go ahead and use their statistics. There is no rule to prevent them.

Mr. Young: You have got to deal with material in the individual items from the storekeeper's standpoint, but you cannot present to your executives, nor to your Board of Directors individual items of material. They know only one thing and that is money. You must have a classification that reflects your material balance in money. It is the only common unit in the material account, and everything is equated.

Mr. Pierce: The Interstate Commerce Commission is going to require a classified statement of the assets of the railroads as represented by materials and supplies. There is no question that in the same manner they have prescribed a classified statement of expenditures. This statement is not of material issued to the storekeeper and the controller of stock. It is not intended to be. It is ridiculous to consider the material balance as a means of controlling stock that must be ordered from two, to three, four, five or six months in advance of its need. Its functions are not for that purpose. The stock book is a detailed classification balance which every storekeeper must have, and upon which is based the control of stock. A classified statement is for the purpose of general and executive officers having before them a resume of what has transpired, the same as other operating expenses, and for the further and more important purpose of putting a check where a check is needed.

Mr. Pierce: I desire to go on record as requesting a class for car steel, a separate class, I would call it 18-A, and segregate it from Class 17, and I also suggest that superheated material be eliminated from 13-A "flues and tubes," and placed in Class 23-B, "special mechanical appliances."

I am not in accord with the principal of the classification being the same as the physical vocation of the material. When your executive officer desires to know how many flues and tubes you have, he don't want to know how much superheating material you have.

Mr. Rice: I move that we adopt the report of the Committee as read, and continuing the Committee, who will investigate the suggestions offered from time to time by the various members.

(*The motion was duly seconded, put to vote and carried.*)

The Chairman: I might say that a number of railroads have written to the Secretary for copies of the classification. He has orders now for about 2,000 copies, and I will ask if it is the intention that we print a standard classification separately, for distribution to those railroads that may want it.

(*The motion was put to vote and carried.*)

Meeting adjourned at 1:10 p.m.

Distribution and Accounting for Gasoline

POSSIBLY THE CONSUMPTION of no one commodity used by the railroads has increased so much and advanced in price so rapidly in the last decade as gasoline.

With its uses greatly extended, with its consumption multiplied a thousand fold, with the old prices quadrupled, the storage, distribution and accounting for this commodity becomes a subject well worth the serious consideration by those who carry the responsibility of the economical and accurate handling of railroad material and supplies.

The stores department of the Missouri Pacific has given this

Some enterprising mathematician recently figured out that the gasoline purchased by the Illinois Central in 1921 was enough to have run an automobile, at the rate of 20 miles to the gallon, more than 400 times around the earth. It would keep the car going continuously 24 hours a day at 20 miles an hour for more than 50 years. This is a striking illustration of the amount of gasoline used by the railroads and emphasizes the importance of the subject of Mr. Hyatt's paper.

The equipment which has been developed on the Missouri Pacific for handling gasoline includes transfer pumps at the main storage points, a special tank car fitted with a measuring pump and delivery hose to take care of distribution to roadside tanks and corrugated drums for underground storage. To prevent the misuse of gasoline for automobiles, a small proportion of lubricating oil is added to it as it is delivered from the supply cars.

commodity special study, and without having much in the way of precedent, we feel that during the last ten years we have worked out some satisfactory and economical methods and practices, especially in the storage, distribution and facilities for economical handling.

Ten years ago, we had gasoline storage capacity averaging from 1,500 to 9,000 gallons at each of our 16 different division stores. Today we have consolidated this storage to four central points and installed batteries of tanks giving any one of these central distributing stores a storage capacity of from 20,000 to 30,000 gal. from which gasoline is distributed to 16 operating divisions; 9 by supply tank cars, and 7 by drum shipments.

Four of our supply car outfits include with their equipment, one 10,000 gasoline tank car, which we specially constructed with reinforced frame and trucks, to avoid as far as we could the possibility of the car becoming bad order, and getting tied up out on the divisions, thus breaking our supply car schedule, which we all agree causes extra expense and crippled service. Each of these gasoline supply cars has a steel housing built and riveted to one end of the tank (3 ft. deep, 3 ft. 4 in. wide and 7 ft. high) which protects and incloses a five-gallon self-measuring pump.

This housing serves the double purpose of protecting the pump and its operator from the elements, from mechanical injury and also prevents tampering by unauthorized persons when the attendant is absent.

It is quite important that this steel housing and the pump be built and joined integral to the steel tank, so that a shock such as would cause the tank to shift on the trucks and frame will not damage either the pump, the housing, or piping. Broken pumps and damaged piping will be avoided by following this suggestion.

We also have built a boxed trough along full length of each side of the tank car, in which is kept a 50-ft. steel armored 1½-in. gasoline hose. One end of each of the two hose is connected to a pipe line, which extends from the pump to the running board of the car on each side, the object of this arrangement being to avoid the necessity of dragging the hose back and forth between the cars, to serve the underground storage tanks at tool houses which are located on either side of the track.

When supply cars are spotted at the tool house, one of the supply car men ascertains the contents remaining in the storage tank with a special measuring stick, so as to avoid running the tank over, as might happen, should he not know how much gasoline was in the tank, as quite likely the majority of the requisitions filled by supply cars are made out from 20 to 30 days in advance of delivery, and the quantity of gasoline ordered is more or less a guess on the part of the section foreman, censored by the roadmaster, who has the advantage of knowing the average quantity ordered by all his sections and should detect any abnormal order.

The quantity ordered on the requisition is governed by what is considered as full protection for 30 days at each given storage point, and in very few instances is it necessary to completely fill the 120-gal. storage.

On some roads the quantity of gasoline put in these roadway storage drums for a 30, 45 or 60-day supply rests entirely with the supply car man and his judgment which, in some cases is aided by providing him with a blue print table showing the average monthly mileage made by the motor car or cars obtaining fuel from each given section storage tank, and the maximum quantity of gasoline required; the print also showing the number of oil lights operated on each section and an illuminating oil schedule.

Eight or ten years ago when the first great strides were beginning to be made on railroads to substitute and replace man-driven power with gasoline-driven power, the first problem confronting the stores department of the Missouri Pacific was to design and adopt a standard storage tank for roadway use, and after some time spent in experimenting and study we adopted an underground storage tank which has since proved entirely satisfactory,—this drum is a 120-gal. corrugated No. 18 galvanized iron drum, which we specify to be painted with rust resisting paint. The capacity of 120 gal. was chosen in order to insure sufficient storage at a time when gasoline was being shipped out in 55 or 110-gal. lots, giving a little storage leeway to avoid holding the shipping drum. The corrugated style was adopted not only to give strength but also to have a drum that would stay buried as we found that water would force smooth-sided tanks out of the ground in the swamp districts of the South.

These drums are buried at the end of the section tool house, usually about 15 or 20 ft. from the track, which is in easy range of our filling hose. They are set vertical and from six to ten inches below the surface, a 2½-in. nipple with chained cap extending above the surface, from which gasoline is drawn by use of a tin gasoline pump, which is kept locked up in the tool house.

This pump is manufactured by the store department, and its construction is not only simple but very durable. We consider that this complete outfit makes a very economical method of handling gasoline for sections and pump stations.

Bridge and building outfits, or in fact any unit of our forces who move from point to point, carry these same storage drums on their open outfit cars. We have 846 of these drums in service on our lines, or 120-gal. gasoline storage for every (9) miles of railroad.

Prior to the general adoption and installation of these underground storage drums, we either used ten-gallon oil cans, or held the oil companies' 55-gal. shipping drums to answer as storage, and there were times when we had had as high as 2,000 drums on our lines, and the enormous volume of clerical work in recording their movement, length of time held, and tracing and obtaining the final return to the owners or paying for drums we lost entailed an expense which has been eliminated so far as gasoline is concerned, on the Missouri Pacific.

The Santa Fe, Union Pacific and several other roads have found it both expedient and economical to reclaim a variety of old drums, reservoirs and miscellaneous containers, which after being tested for leaks and painted with a good coat of preservative against rust are distributed as roadway storage with varied capacities at different locations.

One source from which they obtained a great many gasoline storage receptacles was by making use of all the Pintsch gas reservoirs which were removed from their passenger equipment at the time electrical lighting was installed, these gas drums being cut in two in the center, cleaned of all sediment and incrustations and each half made into a drum by being headed and provided with a uniform hole for the filling and withdrawal of gasoline.

One of 10,000 gal. gasoline supply tanks serves four divisions having 220 storage drums, to take care of this same territory by drum shipments would require at least 300 of the standard commercial 55-gal. drums, and considering that the average life of one

of these shipping drums cannot be figured as over four or five years, and their cost from $5.50 to $10.00 each; also figuring the loss and damage in transit, it is reasonable to assume that the circulation of one large tank car is more economical than the handling and circulation of 300 shipping drums.

At our main store points where we have our battery of gasoline storage tanks, we have installed small reciprocating transfer pumps which operate either by air or steam pressure, according to which is the most handy; these pumps quickly and economically transfer gasoline into our storage from line tanks, or from our storage to the supply tank cars.

The labor cost of filling a large line tank car by use of these transfer pumps at headquarters is practically nothing, while the unloading, filling, and reloading of 10,000 gal. gasoline in separate 55-gal. shipping drums will cost close to ten cents for each drum handled (based on actual test), even with the best facilities.

Accounting

In writing of the accounting we will deviate from the strict meaning of the word as used on railroads and instead dwell on the matter of controlling the issues and the stoppage of gasoline leaks or of gasoline being confiscated for purposes other than company or railroad use.

To control the issues and consumption of gasoline on the Missouri Pacific we are following the matter up on all divisions by

.....Railroad

MAINTENANCE OF WAY DEPARTMENT

....
Station Division

Month of.....19.....

Kind of Station.....

Type and Kind of Engine.....Factory No.....

Hours Engine Operated.....H. P.....

Condition of Plant.....Rated RPM.....

	Gasoline	Headlight Oil	Engine Oil (Other Oils)	
	Gallons	Gallons	Pints	
On hand 1st of Month				
Received from Store Department				
Received from other sources				
Total				
Used in operation of Engine				
x—Used for other purposes				
o—Furnished other parties				
Total				
Balance on hand				

(Signed).....

REMARKS

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x—Explanation should be made under "Remarks"—What purpose used for.
o—Must have signed receipts to cover total amount of consumption under this item.

Exhibit A

requiring all section or extra gang foreman to furnish their superintendent a monthly report on which they show the total number of miles they have run their motor car during the month and the total gallons of gasoline they have used as well as the amount of lubricant.

This report also shows how much if any of their stock of gasoline was furnished to itinerant motor cars so that proper charge can be made through the superintendents material distribution, officers or other employes taking this gasoline have instructions to leave a note in the section tool house advising the gasoline taken, or else tell the foreman along the road when they come across him.

The one railroad, requires a monthly statement from their gasoline users, that requires more detailed information and a monthly balance of the gasoline on hand, sample form submitted. (Exhibit A.)

Some of our superintendents have requested and are procuring from our storekeepers a monthly statement giving our record of the gasoline which our supply cars furnish each of his section and B. & B. foremen, and undoubtedly if this report is used in conjunction with the one he gets from his own men, all is being done so far as records and statistics are concerned as would be within the bounds of practicability to regulate issue.

Where a blue print schedule, as previously mentioned, is furnished the supply car men, giving the allowances of gasoline to each point, it would be questionable as to the necessity or value of such a statement.

To discourage or avoid theft there are many effective methods, practically all of our storage drums that are located along the line or in isolated places have some device to prevent access. Many of the underground storage drums have small platforms built on the surface fastened to driven posts to make them secure, these platforms having one plank hinged and by use of a hasp and staple are kept locked.

Another effective method of locking an underground tank is to have a slot cut through the gas pipe leading to the drum, then by using a flat tee shaped iron slide with a hole in one end for a padlock, it can be locked against the insertion of either a hose or pump.

However, the very design of our standard storage outfit practically preludes the use of any pump other than the pump furnished with the equipment.

On some of our divisions at the time the gasoline is delivered from the supply cars, it is doctored by the addition of lubricating oil. One pint of oil to sixteen pints of gasoline seems to be most generally used. This makes the fuel unfit for anything but the roadway types of motor cars, and as Mr. Hall stated in his article, "A person might try this mixture in his automobile once but never again."

The Santa Fe has gone very extensively into the proposition of the making and the use of a mixed fuel for railroad motor cars which cannot be successfully used for automobiles, and at the same time being a cheaper fuel than straight gasoline.

At their stores from which the supply cars operate, they have constructed a large mixing tank which is connected by pipes to their gasoline storage and to their kerosene or distillate storage.

The mixing tank is filled with 60 per cent gasoline and 40 per cent kerosene or distillate, and after the addition of the proper proportion of heavy lubricant, the contents are thoroughly mulsified by agitation which is accomplished by the admission of compressed air into the tank through an arrangement of pipes, the mixture is then conveyed to storage tanks for use.

The writer does not know whether the above mixture gives satisfaction the year around or not, it may be that the percentage of gasoline is increased for winter use on their northern lines.

In the use of mixed motor car fuel, provision would have to be provided at terminals from which inspection or official cars having automobile engines could procure their supply of straight gasoline.

(The above report was prepared by L. V. Hyatt, Inspector of Stores, Missouri Pacific.)

Mechanical Division Elects Officers

THE ELECTION of officers of Division V, Mechanical, A. R. H., yesterday resulted as follows: Chairman, James Coleman; Vice-Chairman, John Purcell; Members of General Committee, C. F. Giles, T. H. Goodnow, A. Kearney, J. T. Wallis, W. H. Winterrowd, C. E. Chambers, and L. K. Silcox. To fill unexpired terms on General Committee ending June, 1923: W. J. Tollerton and H. C. Oviatt.

Mark Purcell
First Vice-Pres.

L. P. Streeter
President

George H. Wood
Second Vice-Pres.

1922 Convention of the Air Brake Association

Large Gathering Listens to Paper by Prof. S. W. Dudley on Wastes in Air Brake Service

THE TWENTY-NINTH annual convention of the Air Brake Association opened Monday, June 19, 1922, in the Vernon room of Haddon Hall hotel, with an attendance of over 350 people. This is the first time that the association has held a convention at Atlantic City and of course the first time that its meetings have been in conjunction with those of the Mechanical Division of the American Railway Association. No regular convention was held in 1921. The officers and executive committee held a meeting, however, at Hotel Sherman, Chicago, May 3, 1921. At that time such business was transacted as required attention and reports from the various committees were received, but were not discussed. Several of these, however, will be taken up for topical discussion at the present convention.

Some 225 registered before the convention started. This compares well with previous meetings, but somewhat delayed the opening, and the meeting was not called to order until 10:30 a.m. by the president, L. P. Streeter, air brake engineer of the Illinois Central. Doctor Newton W. Caldwell, pastor of the Olivet Presbyterian Church, then opened the convention by invoking the divine blessing. The address of welome was delivered by Edwin F. Bader, mayor of Atlantic City. This was scheduled to follow immediately after the opening prayer, but Mr. Bader was delayed on acount of having to attend an important conference. He arrived a little later in the morning, however, and gave the association a most hearty welcome to Atlantic City and presented to the chairman a full-sized key to the city.

A past president's badge was given to L. H. Albers, New York Central, the presentation speech being made by B. J. Feeny, Illinois Central. One was also presented to T. F. Lyons, New York Central, the speech being made by E. F. O'Connor, Southern Railway.

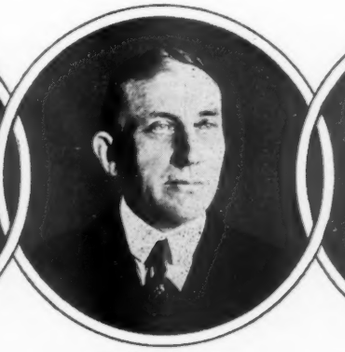
President's Address

President L. P. Streeter then presented the following brief opening address:

It is with keen appreciation of the honor which the Association has conferred upon me that I extend a cordial welcome to you at this convention. I believe our convention will be productive of great benefit to all concerned, and there is every reason why it should be the best held so far.

This is the first time that many of our members have had the opportunity to see the extensive exhibits brought together annually by the railway supply men of America,

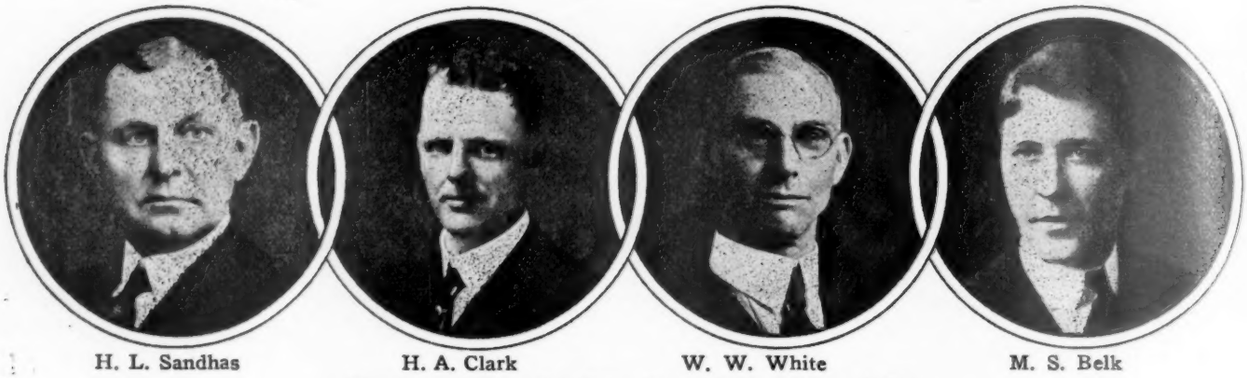
Otto Best
Treasurer



F. M. Nellis
Secretary

C. M. Kidd
Third Vice-Pres.

R. C. Burns
Ex. Com.



H. L. Sandhas H. A. Clark W. W. White M. S. Belk

Members of Executive Committee, Air Brake Association

which draws railway men from all sections. The genius and mechanical ability of our country, especially in railway transportation, leads the world. Keeping this in mind, I trust you will all make careful study of the exhibits and take back to your respective managements the results of a study of means and ways to improve conditions, which can best be accomplished by men like you who know the situation from the practical point of view.

We have a right to be proud of achievements of our Association which during the twenty-nine years of its existence has stood for a higher development of the air brake art, and I believe is largely responsible for the safety and care of the traveling public and the safe movement of goods necessary to their comfort. The Air Brake Association has developed a body of men of which we have reason to be proud, and they can be classed with the most conscientious and hard-working part of our railway organization, many occupying positions of responsibility and honor.

Our organization is filling successfully a highly specialized field of work with increased responsibilities, and our cordial relations with the American Railway Association evidenced by our meeting here during its convention goes to show that we are a recognized factor in the railway world. Our work also has the hearty indorsement of the Bureau of Safety of the Interstate Commerce Commission.

I believe the future of our association is a bright one if we keep in mind the fact that we are primarily an educational body, endeavoring to encourage in every way the so-called "little fellow" who by our help may develop into a most useful member in the railway field, and if I have helped toward this end in any way, I will feel well repaid for such efforts as I may have devoted to the cause.

Following the opening remarks by the president the report of the secretary was presented by F. M. Nellis. In the absence of Otto Best, Mr. Nellis then read the treasurer's report. These reports showed the association to be in a healthy financial condition.

Denver Secures Next Convention

In order that the educational work of the association may be of the greatest benefit to its members, many of whom attend at their own expense and who are scattered all over the country, it seemed best to the executive committee to continue the practice of holding some of the meetings in the West as well as in the East.

In announcing the decision of the executive committee to hold the next convention in Denver, the president also called attention to the fact that instead of a direct amalgamation with the American Railway Association which has been under consideration for some time, it had been decided best to maintain the present individuality of the Air Brake Association. A close affiliation and co-operation with the A. R. A., which the amalgamation question has brought about should, however, result in all the benefits which would have been obtained by affiliation.

The only paper presented at the first session was by Prof. S. W. Dudley, of Sheffield Scientific School, Yale University. The paper contained much that should prove an incentive to every member to carry out the aim of the association which is "to obtain a higher efficiency in air brake service."

Wastes in Air Brake Service

By S. W. Dudley

WHY CONSIDER WASTES? Isn't this a country of unlimited resources? Most of us know better than to make any such absurd claim, but not yet are we willing to face the problem of waste elimination soberly and act according to the plain facts. In our feverish haste to set new records of production and distribution, our leaders in industry and commerec have been concerned most of all with getting results,—making a new record. Rightly so, in many instances. Under the conditions of our generation, the development of a new industry, the establishment of a pioneer commercial enterprise, the building of a transcontinental railroad—all such efforts—to insure success, had to proceed with the ends, not the means, chiefly in view. But is there not a point, beyond which the returns to posterity, if not those directly concerned, will surely, although perhaps not obviously, diminish, unless our natural resources—our capital funds—material and otherwise are conserved?

The Great War has brought home to thoughtful people here the object lesson of the European nations, who are, and have been for years, face to face with the struggle for existance on what seems to us a hopelessly narrow margin between natural resources and national needs. Only recently have any of us become much impressed with the necessity for conserving our own vast natural resources. It has now become a common saying that some nations would live comfortably on what we, as a nation, waste.

Nature herself is, of course, a collosal wastrel—witness the multitudes of acorns which never become oaks. But nature is also a bountiful provider. Man, when he uses the resources pro-

vided by nature, wastefully and without replacement, is thoughtless, careless and ignorant, if not criminal. It is not the use, but the abuse, that is dangerous to the well being of ourselves and our children.

"There is that scattereth, and yet increaseth; and there is that withholdeth more than is meet, but it tendeth to poverty."

Material waste is only one side of the story. The waste of human time and effort, under our modern complex industrial systems is equally far reaching.

It is one of the encouraging signs of the times that these questions are being studied scientifically and earnestly by the best trained brains in this country and that their conclusions and recommendations are being listened to and acted upon by practical men, executives and financiers in all lines of industry.

Late in 1920 Herbert Hoover was elected the first president of the newly formed Federated American Engineering Societies and with characteristic practical vision he asked the question, "What can this Society do to benefit industry?" At the first meeting for organizing the Federation Mr. Hoover himself proposed an answer. "There is a vast amount of restriction and waste in the 288,376 industrial establishments listed by the census of 1919. Let us study this waste—see what it is, and what can be done about it."

It is well to stop a moment here and notice the standing and ideals of the organization proposing this study. The Federated American Engineering Societies is an inclusive national organization of over 75 national, regional and local engineering and allied technical societies, such as the A. S. M. E., the A. S. C. E., the A. I. E. E, the A. I. M. E and so on. Their common ideals have been expressed as follows: "Engineering is the science of controlling the forces and of utilizing the materials of nature for the benefit of man, and the art of organizing and of directing human activities in connection therewith. As service to others is the expression of the highest motive to which men respond and as duty contribute to the public welfare demands the best efforts man can put forth, now, therefore, the engineering and allied technical societies of the United States of America, through the formation of The Federated American Engineering Societies, realize a long cherished ideal—a comprehensive organization dedicated to the service of the community, state and nation."

Waste in Industry

This organization accepted Mr. Hoover's suggestion with enthusiasm and a committee of 18 engineers of broad experience, clear vision and unbiased attitude toward industrial problems was named to make a study of the waste in industry.

The essence of the plan adopted by the committee was to gather quickly such concrete information as might be used to stimulate action, and lay a foundation for other studies. Within the remarkably short time of five months there had been completed an analysis of waste in six typical branches of industry. The complete report is included in the volume entitled "Waste in Industry," published in 1921.

This report has been discussed before engineering societies and clubs, industrial organizations and conventions of all sorts. It therefore seems to me most fitting that this Air Brake Association, which has been actively engaged in promoting a higher efficiency in air brake service for almost 30 years, should signify in a rather definite way, its hearty interest in and support of this nation-wide movement against avoidable wastes in industry.

We may feel justly proud of the many papers and committee reports on record in our proceedings dealing with various phases of this subject in our own field. Probably 50 per cent of the technical papers and reports presented at our conventions have dealt with ways and means of preventing waste of materials, labor, time or human effort and energy in air brake service.

Stopping Air Leaks

An excellent example is the magnificent work accomplished by the Committee on Air Consumption of Locomotive Auxiliary Devices, under Mr. Weaver's able leadership. His reports, at this and the two preceding conventions, are full of original and practical information and sound recommendations. They deserve to be studied and acted upon. The railroads will benefit directly as the sources of loss and efficiency mentioned are attended to. This Association and the railroads could show the appreciation which this thorough investigation merits in no better way than by adopting its standards of performance and methods of testing as a part of their recommended or standard practices.

The conditions disclosed by the report of this committee certainly justify immediate and thorough action. Such action has already been taken on several railroads. Why should not the supervisor of air brakes have at least one man, possibly one at each terminal and division point, whose sole duty should be the finding and stopping of air leaks? He would be a busy man and might need several helpers, but would it not pay? A good live young fellow, interested in his job, would soon learn a lot about what should and could be done. Call him the air leakage inspector, if you choose. I believe the committee will back me up in saying that the results would astonish you.

What Kind of Wastes?

Wastes in air brake service are by no means only those direct losses due to leaky or inoperative devices, or to materials or supplies actually lost or damaged. In a foreword to the Engineering Societies' Committee report, Mr. Hoover said some things which apply to the air brake service, as well as to the general industrial situation which he had particularly in mind: "We have probably the highest ingenuity and efficiency in the operation of our industries of any nation. Yet our industrial machine is far from perfect. The wastes of unemployment during depressions; from speculation and over production in booms; from laor turnover; from labor conflicts; from intermittent failure of transportation of supplies or fuel or power; from excessive seasonal operation; from lack of standardization; from loss in our process and of materials—all combine to represent a huge deduction from the goods and services that we might all enjoy if we could do a better job of it."

In assigning responsibility, i.e., relative opportunity for knowing and doing better, the committee placed (roughly speaking) 50 per cent upon management and 25 per cent upon labor, the remainder being placed upon outside contacts, such as the public, trade relationships, etc.

Management has the greatest opportunity and hence responsibility for eliminating waste. But it must have the cooperation of labor in order to better the present record.

Do not overlook the fact that waste is a permanent impairment of our reserves. We are in large measure opportunists. We think only of the present, we live today;—let tomorrow take care of itself as we have had to do.

Time; energy, both human and mechanical; money, materials, and equipment must all be wisely directed and intelligently used. Many of our most serious losses arise from our failure to use the time and energies of past generations, as well as those of living men. Committees, rules and reports point the way but are powerless until translated into right action at the right time and place by the man on the job,—whether he be the general manager or the yard inspector.

What is a Good Organization?

The Federated American Engineering Society's Committee found that good organization was one of the best safeguards against waste in industry. What is a good organization? Suppose you had a crew made up of Charley Weaver, Otto Best, Mark Purcell, Frak Barry, Charley Kidd, George Wood and Pat Langan. That would be "some" organization, wouldn't it? But who would carry the stencil brush and the grease pot?

An organization is a good deal like a locomotive. You will find a few cranks and eccentrics. There are some very rigid and unyielding members, like the frames and the guides. There are some that make a lot of nosie, like the bell and the exhaust. There are some that actually restrict and restrain, like the throttle and the yokes. But the cranks make the wheels go around. The eccentrics actuate the valves, the rigid and unyielding frames and guides keep the moving parts together—and also apart. Noise, in its proper place, means protection and safety. Restriction and restraint, properly exercised and in proper amount, mean adaptability to the task in hand and plenty of reserve for peak loads and unexpected emergencies.

So with an organization—"It ain't the star performer alone that makes the goal, but the everlasting teamwork of every bloomin' soul."

Well, there are many causes, some evident and easy to cure, some not so evident and not so easy to overcome. Lack of vision,

faulty management, ignorance, carelessness, lack of team work, inadequate or improper equipment or installation, lack of proper or sufficient repair parts, materials or tools, the wrong man on the job and (perhaps the most serious of all) not enough trained men to do the work.

I want you to read again Mr. Frank McManamy's address before our 1920 convention particularly. Listen—"I have always felt that the air brake man was working under a rather strong handicap and that while he was a mighty good fellow, there were too few of him." "With the additional work the air brake man has to perform outside of organizing his departments and looking after the brakes, and looking after men that handle brakes, he is able to give entirely too small a proportion of his time to the actual maintenance and operation of the brakes. It seems to me that we shall never get the air brake conditions which are desirable, and which are in fact necessary under modern methods of railroad operation, until we increase the air brake departments on practically all the railroads"—"We must have first, men to plan the reorganization. We must have, second, the facilities to permit the work to go forward. To get both of these we must have support from the higher officials of the railroads, because while it will cost them a little money at the start, it will pay. It will be one of the biggest dividend payers that they have on their railroads."

Make no mistake about this. This is not an air brake man trying to land a job or get an increase in salary. It is the deliberate practical judgment of a good business man, an executive of wide experience, accustomed to look for the facts wherever they may be found and to face them squarely when found—A little further on he says: "If the rules and recommendations of this Air Brake Association were being observed on all the railroads in the country, we would not need any federal laws relative to the condition of air brakes." This is a compliment and a challenge. Gentlemen, it lies in your power today, more than ever before, to make these rules and recommendations effective through cooperation with the proper agencies of the greater Association with which you are now affiliated.

What Can We Individually Do to Improve Matters?

Keep right on, pegging away. Get and create in others, habits of foresight, analysis, thrift, efficiency and effectiveness. Look ahead a little, size up the job and make every move and everything count. Education is needed all along the line. Show the management the facts and what ought to be done. Perhaps they will not listen or understand at first—probably you didn't. But keep right on urging proper equipment, proper installation, proper and sufficient repair parts and tools, and above all better men and more of them.

Just a few concrete examples of what you men on the firing line see every day. And in this connection let no one miss the point that mere muck-raking as a pastime is no longer the fashion. The spirit of constructive criticism has taken its place. *Today* we look for the facts, favorable or otherwise, because we want to find out how to do better *tomorrow*. The times change rapidly and tremendously. What could and should be tolerated to help along the progress of yesterday needs curbing, perhaps elimination, today. Standards must advance with knowledge and facilities. Fault finding is profitless, but not to see and take advantage of an opportunity to improve conditions is a crime.

First a quotation from a letter from L. W. Wallace, the executive secretary of the Federated American Engineering Societies.

"I am very much interested in knowing that you are to discuss the topic 'Waste in Air Brake Service.' This is an important subject.

"Perhaps you will be interested in knowing that the larger part of my professional experience has been in connection with railway mechanical engineering. While serving a special apprenticeship on the Santa Fe, I specialized somewhat in air brake work. At one time, I made a study of the waste of compressed air about the Cleburne shops. It was found that there was a very large waste occurring through leaky valves, improper hose connections, faulty air drills and by workmen leaving the air turned on such equipment while not using it, at noon hours and other times. Through correcting these things, a *lack of air supply* was converted into an *abundance* and a *low* pressure, brought about by leakage, was changed to a *sufficient* pressure. This made it unnecessary to *purchase additional* air compressors which had been contemplated. I am confident that this situation is duplicated in many of our railroad shops."

Without further mention by name, but with hearty thanks for their cooperation, I wish to quote or refer now to several suggestions received from active and influential members of this Association (most of them members of the Manhattan Air Brake Club) as to concrete cases which illustrate clearly what we have been thinking about. Excessive leakage is, of course, an old and an everpresent source of waste, delay and inadequate control.

First, therefore, a good suggestion regarding leakage:—"I do not feel that you can lay too much stress on the necessity of railroads providing a departure yard suitably equipped with air brake charging lines with a view of eliminating excessive leakage and correcting irregularities that may exist when there is adequate time, rather than performing this work after the hauling locomotive is attached to the train when the time is limited. This does not only mean assisting the life of the compressor and accessories but goes a long way towards assisting proper and economical functioning of the air brake equipment."

Insecure pipe clamps, use of the human instead of the soap brush to locate leaks and carelessness about retainer pipes and unions are well known but altogether too common sources of leakage. These and other short comings of installation and inspection are of much more consequence on a locomotive than on a car, because "a locomotive failure is a train failure."

Why Is Leakage Tolerated?

Do you know why this leakage is tolerated? As in most other cases, the answer has an economic flavor. It is because coal costs only $4.00 per ton.

They don't know what leakage is in Europe. One of your best known members told me of riding on a French railway locomotive during the war and being almost paralyzed to see the engineer calmly reach over and shut the throttle valve in the air compressor steam pipe shortly after leaving the station. There was about 80 lbs. pressure in the system and there it stayed until the brakes were used to make the next stop, when the pump throttle was opened up and the pressure restored. There *were* no leaks—they were not tolerated. Why? Because at that time coal was $64 per ton and the engineman received a bonus on every pound he could save. So it *can* be done.

We avoid the cost of a good tight pipe job, of close inspection and of competent repairing, but burn more coal. We need to do more than make rules about these things. We must have the right kind of men, enough of them and encourage them by giving them the tools, the materials and the proper places to do the work. No man can turn out a decent job with only a pipe wrench, a paint brush and a lack of proper material or conveniences.

The following describes conditions perhaps not entirely unfamiliar to some of you.

"Probably the greatest handicap suffered, in my experience, was and is due to the extreme poor quality of the men that we are provided with for air brake work, it seeming to be understood that any kind of a man will answer the purpose, which of course results in a great loss of time and material, as well as safety. To illustrate:

"While checking triple valve repairs not so long ago, it was found that paper wads had been used to fill the triple piston packing ring openings, which for the minute, permitted the valves to pass the test rack requirements and for the same purpose and in the same lot of valves, a very heavy grease had been used on the piston ring and cylinder.

"Improper tools is another cause for a waste of time and material. While watching one of our men cleaning the brake equipment on a car recently, it was noted that he was using a hammer and chisel for removing nuts from the bolts. On inquiry it was found that he had but a 12-in. pipe wrench for the purpose and this could not be used due to lack of space.

Waste in Air Brake Service

"Pipe wrenches are used also for removing valve chamber caps, reversing valve chamber caps, etc., resulting in spoiling the hexagon, so that the pieces have to be thrown into the scrap.

"Carelessness in the use of new material, instead of repairing the old, results in a great loss. This is especially serious where piece work is in vogue.

"At one time 26 steam heads for 9½-in. compressors were found hidden away in one of our shops instead of being repaired and used because it was much easier to apply new. Of course, these had been some time in collecting, but it illustrates the waste and nearly the same condition prevailed at the same shop in connection with slide valve feed valves for engineers' brake valves."

The savings in material and time which can be made possible by improvements in storerooms and repair yards would scarcely be credited. Here is a concrete case:

"For several years we were unable to have the stores department handle second-had material. When surplus air brake material was repaired, they refused to allow us to place it in stores for filling orders to outside points, claiming that this put the burden of cost on them. At the same time requisitions were not submitted to me for approval. About four years ago I made a check of extra material on the system and found about $35,000 worth of distributing valves, brake valves, feed valves, pump governors, cut-out cocks, etc., lying in engine houses, shops and repair tracks. This material was repaired and stored for less than $600, including labor. In this lot there were 30 distributing valves that only required a piston packing ring, or an application piston packing, feed valves that only required cleaning, governor bodies requiring reboring, new portions of governors that had been stripped to make repairs to second-hand material and triple valves. This was the direct result of drawing on the stores department for new material without returning the old parts for repairs. While we furnish enginehouse inspectors with material that requires no work except application to the locomotive or tender, they do not clean feed valves or distributing valves, but draw new ones on the stores department. We found that the shop repairmen and pipe fitters were ordering material that did not move from the stores department in many instances for eight to ten months. The pipe fitters were going to the stores department for new material when the old material would have served the purpose just as well. As evidence of this we found 1,200 ¾-in. and ½-in. cutout cocks which were thrown in different places in the shops, all of which were made good by regrinding and placing them again in service.

"After noting the indifference of the men in regard to material, we checked all requisitions to prevent duplications of the above parts, and are satisfied that from our present system we are saving from $10,000 to $15,000 per year without in any manner diminishing the safety or efficiency of the service. We then checked all the storehouses on the system and found hundreds of parts of special retaining valves, feed valves, governors, etc., which we assembled and placed in stock for distribution. The result of this is we have not ordered any of these parts, including triple valves, for the past four years, and having a check of the number of whole parts on hand at the different points on the system, duplications can be made only through loss by accident.

"At our main car shops where heavy repairs are made which require taking down the entire brake apparatus, we found that the amount of pipe work was so great and the distance from the pipe and cutting machine so far, that six men were required to do the work which four men could do equally well.

"Where five foreign lines deliver to us, we found that the number of non-operating brakes were so great that it was necessary to add six men to the force, two on each eight-hour trick. In our fast freight trains we put in at least four to eight cylinder packings in each train. To save time we furnished pistons complete with packing leathers, so that when one was removed from the cylinder under the car, a complete piston was added and the work of re-applying the leather was done when there was no train work. The trains then departed with 100 per cent operative brakes, and nearly always on time. We have placed standard triple valve test racks at all terminals where air is supplied to repair tracks, 10 in number, and all cleaning of triple valves is done in the shops instead of on the car. A laborer carries the triples to and from the test racks to the cleaners. All triple valves are sent to one point for repairs.

"Lack of material was always an excuse for not doing work properly and efficiently. I found on visiting the different stations that they were always short of certain material, and that requisitions were not promptly filled. We appointed one man whose sole duty is to visit all repair stations, note requisitions and see that no place suffers for want of material. This worked out perfectly as we find now that there are no delays in shipments of material, unless it is that for which we are waiting delivery from the manufacturer.

"It is a noteworthy fact that foremen at shops, enginehouses and repair tracks never check up the work of air brake men. This is probably due to the fact that they were never interested in the work and know very little about it. We, therefore, depend upon the men to honestly perform their work, and to do this they must be furnished with the necessary devices and material. The proper location of locomotive and car air devices is essential, as an improper location of such devices means neglect on the part of the workmen."

In your own Proceedings and in those of many of the railway clubs these truths have been emphasized over and over again. One of the most notable of these is a paper on "Freight Brake Maintenance" presented by F. B. Farmer before the Canadian Railway Club, April 1918. This paper should be studied and adopted as a standard text by every air brake instructor and inspector in the country.

The sole purpose of a railway is to save time. Therefore, the greatest possible waste is that of time. To operate the railways human energy and skill are necessary in the highest degree. Therefore, misdirected or unduly overloaded human energy is a source of avoidable waste. To permit human energy and skill to function effectively and efficiently, proper organization, policy and support must be provided. Therefore inadequate organization, lack of understanding and vision, and insufficient funds, materials and equipment cause lower efficiency, diminish effectiveness and result in far-reaching wastes. Expensive "economy" and wasteful "saving" must be guarded against. To paraphrase a well-known Arabian proverb:—

"He who wastes and *knows* that he wastes is a fool. Avoid him.

He who wastes and *knows not* that he wastes is simple. Teach him.

He who wastes not and *knows not* that he wastes not is asleep. Wake him.

But he who wastes not and *knows* that he wastes not is a wise man. Follow him."

"Courtesy George A. McKeague, Official Photographer."

Three M. C. B. Veterans

Left to Right—F. W. Brazier, N. Y. C.; John S. Lentz, L. V.; and J. J. Hennessey, C. M. & St. P.

Efficiency of Enthusiasm

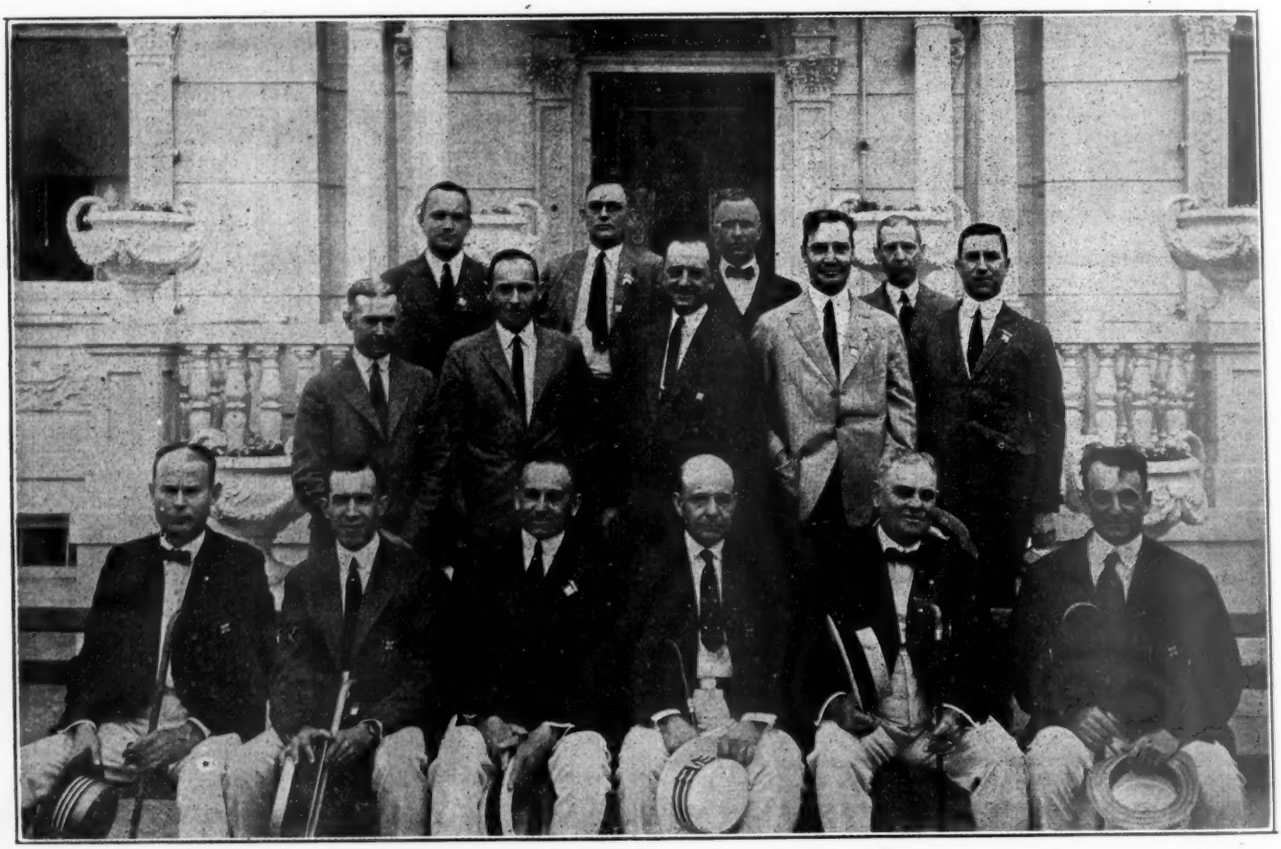
ONE of our friends has handed in the following tribute to the men who have set up and arranged the big exhibit:

"To the observer who has been present on the Pier during the last two days the transformation from a scene of absolute chaos to one of order and perfection must have made a deep and lasting impression. On Monday morning with the exception of a few large and elaborate exhibits, some of which require many days and even a week or more to set up, there was practically nothing but an indiscriminate mass of packing cases and debris of all kinds strewn over the pier. Apparent disorder seemed to reign supreme, but behind and underlying all was a definite well-thought out program which within a few hours would be put into effect.

"In the brief period between Monday morning and Tuesday night the entire pier has been converted into a glorious and beautiful display of the finest mechanical products of American skill and ingenuity. And when one contemplates the speed and almost magical swiftness with which these packing cases have been turned into magnificent exhibits arranged with artistic skill and in a manner best to educate and interest those for whom they have been created. One cannot but be impressed with this remarkable transformation and he naturally wonders how is it all possible.

"How is it possible to accomplish all this work in so short a time as perhaps twenty-hours? There is only one answer and that is that this wonderful work is the result of interest and enthusiasm. No paid help could accomplish what has been done in twenty hours on the Pier in ten times the number of hours. Nay, it is safe to say that paid help could not have done it at all. Nor are the men who have set up these exhibits with few exceptions skilled workmen. Most of the work is done by salesmen, engineers, advertising men, clerks and office help. But what these men have lacked perhaps in skill as workmen, they have made up a thousand-fold in their interest and enthusiasm.

"Just look at these beautiful exhibits. As much the work of artists as any painting or statuary. Put up in absolutely perfect shape without blemish, not even a finger mark marring the finish of these really works of art. Such is the result of American resourcefulness, American energy, and that indomitable spirit of progress that pervades the entire railway supply fraternity. Who can help but admire that wonderful attribute of our American civilization so forcefully exemplified in this demonstration of the efficiency of enthusiasm."



"Courtesy George A. McKeague, Official Photographer."

Enrollment Committee

Standing, left to right: R. Van Steenburgh, The Okonite Company; C. L. Bates, Railway Review; H. S. Patterson, Walworth Manufacturing Company; C. W. Sullivan, Garlock Packing Company; J. E. Brown, O'Malley-Beare Valve Company; S. Inglis Leslie, The Leslie Company; L. D. Mitchell, Detroit Graphite Company; Arthur Haller, American Locomotive Company; F. C. Koch, *Railway Age.*

Sitting, left to rgiht: H. V. McKedy, The Glidden Company; H. K. Williams, Safety Car Heating & Lighting Company; J. E. Dodson, United States Rubber Company; Franklin H. Smith(chairman), Gold Car Heating & Lighting Company; G. A. Barden, King Pneumatic Tool Company; G. E. Ryder, The Superheater Company. (Edward Wray, Railway Purchases and Stores, missing.)

L. C. Hensel
President

E. S. M. Macnab
1st Vice-President

E. Lunn
2nd Vice-President

J. A. Andreucetti
Secretary-Treasurer

Electrical Engineers Meet at Hotel Dennis

Lengthy but Interesting Program Draws Large Attendance and Provokes Good Discussion

THE SEMI-ANNUAL MEETING of the Association of Railway Electrical Engineers, held at the Hotel Dennis, yesterday morning, was called to order at 10.10 a.m., by E. S. M. MacNab, first vice-president of the association, in the absence of the president, L. C. Hensel. In presenting the opening address Mr. MacNab spoke as follows:

"I am glad to welcome you to this semi-annual convention of the Association of Railway Electrical Engineers, and to see such a good attendance of members.

"I must first apologize for the absence of our president, L. C. Hensel. Those of us who know him, I am sure, agree that it is most urgent business which prevents him being with us today, as he has always been most attentive both at convention and executive committee meetings.

"This is the first semi-annual meeting which has been held for two years owing to depressed business conditions. However, I feel confident that we have passed the lowest point on the curve and that the near future will restore the normal flow of business which is essential for the prosperity of the railways and the country in general. The railway equipment purchases during the past five months, as shown in the *Railway Electrical Engineer*, were as follows: Passenger cars, 1195; freight cars, 77,053; locomotives, 460. These figures would bear out this contention.

"There will be presented for your consideration and discussion, progress reports from several committees, and I would ask that we have a very full discussion, and if any member has any data or information which he can bring out it will materially assist the several committees and at the same time make their reports more complete.

"We will also be favored by having a paper on 'Industrial Heating' read to us by B. F. Collins, of the General Electric Company, which I am sure will be both interesting and instructive. It is a subject that has come to the front of late and this paper will constitute a valuable addition to the proceedings of the association.

"In closing, it is hardly necessary to draw attention to the splendid collection of exhibits on the pier. I often think that we do not sufficiently appreciate the advantages we have by being able to inspect the latest additions in all the branches of the railway mechanical engineering field, and I am safe in saying that in no other part of the world, would it be possible to duplicate this A. R. A. convention."

Data and Information

Immediately following the opening address the report of the Committee on Data and Information was presented by E. A. Lundy, *Railway Electrical Engineer*. Mr. Lundy spoke of the importance of securing authentic data and information and of the need of tabulating it so as to establish valuable records which will show just what is being done by the different roads. Along the same line, J. R. Sloan, Penn. R. R., suggested that it might be desirable to plot curves showing the increase or decrease of electrical equipment during the years.

E. Wanamaker, Rock Island Lines, said he believed it would be of much benefit to the electrical fraternity if some valuation were placed on electrical equipment. He drew attention to the primary importance of electrical apparatus in present day railroad operation and cited the growth of the investment in electrical material during the past 20 years from $3,000 to $3,000,000. Railroad operation is dependent upon electrical equipment to a far greater extent than is generally realized. Railroad managements should be shown the importance of building up an efficient electrical organization so that it can properly purchase, install and supervise electrical equipment.

It was stated by J. A. Andreucetti, Chicago & North Western, that roads did not have figures available which they could supply the committee, although conditions were getting better in this respect since the establishment of valuation departments. He further stated, however, that probably the heads of electrical departments could very likely approximate the value of materials under their jurisdiction.

L. D. Moore, Missouri Pacific, thought that while it might be difficult, that probably the members of the committee themselves could arrive at an approximate figure. It might not be possible to get definite costs, but they could develop a report that would show the relative value of the equipment used on the various roads. The fact is that there has been an increase of six or seven hundred per cent in electrical equipment on the Missouri Pacific during the past 10 years, and if the matter could be brought before the railroad managements the electrical departments would undoubtedly benefit by it.

E. Wanamaker significantly remarked that the tremendous growth of the importance of electrical equipment was not fully appreciated by the electrical men themselves and therefore it could hardly be expected that others would recognize how vital this apparatus had become in railroad operation.

Motor Specifications

The report of the committee on Motor Specifications was presented by Mr. Wanamaker, who stated that the report was at present a tentative specification. Contrary to expectations he said, the various motor manufactnrers, as well as the Electric Power Club, had given the committee the heartiest co-operation in preparation of the material included in the report. The specifications as drawn cover alternating and direct current motors of the open type ranging from 1 hp., 1800 r.p.m., to 75 hp., r.p.m. Mr. Wanamaker further stated that if the committee was continued that it was its intention to take up the matter of specifications for mill type, motors, crane motors, control motors and protective devices.

He also emphasized the importance of bearing design in connection with motors, declaring that there never had been any standards for motor bearings. Two chief causes for motor failures he attributed to failure of insulation and to faulty bearings. Mr. Wanamaker commented upon the great amount of interest manifested in the meetings of the committee which was manifested in the large attendance at monthly meetings and in some cases semi-monthly meetings. He said it was surprising to find how little was actually known regarding the life of motors in service. When conflicting opinions were averaged it was found a life of ten years was the resulting figure.

Committee on Illumination

The report of the Committee on Illumination was presented by L. S. Billau, Baltimore & Ohio. He emphasized the necessity of reducing the number of standards for incandescent lamps as much as possible, stating that the committee had striven to do this. He further stated that the 100-watt lamp was being introduced into car lighting service. It is interesting to note that the increase of car illumination which was prophesied several years ago is now becoming a realization. He stated that the Mazda C gas-filled lamp was now available in the 25-watt sizes. One of the most important factors which electrical men should familiarize themselves with, Mr. Billau stated, was the industrial lighting codes which have been adopted in various localities. He said that the probability was that these codes would become more strict as time went on.

G. W. Bebout, Chesapeake & Ohio, introduced the subject of mill type Mazda C lamps for use on extension cords and stated that the C. & O. had adopted this type of lamp as a standard for this service. He said this type of lamp was giving complete satisfaction and had replaced the old carbon lamps entirely. Mr. Andreucetti held quite an opposite opinion, stating that while the efficiency of the Mazda mill type lamp was high, he could not get long enough life out of them to warrant their use. He stated that the renewals were five times as great as when the carbon lamps were used.

E. Jansen, Illinois Central, agreed with Mr. Andreucetti.

Mr. Wanamaker said the Rock Island had just begun using the Mazda lamps in portable service but that they were having good results and suggested that perhaps there was some difference in the type of lamp being used by the other men.

At this point the discussion swung over to the life of locomotive headlight lamps and cab lamps. It was clearly evident that inherent lamp life and service life were two quite different things. The discussion became very general and many took part.

A. L. Broe, Edison Lamp Works, gave some interesting facts on the subject of lamp manufacture. He stated that cab lamps and car lamps were made with two entirely different aims in view. The cab lamps, he said, were made rugged at the expense of efficiency while the car lighting lamps were manufactured with the idea of securing maximum efficiency. Referring back to the mill type lamp he stated that these should not be confused with the mazda C, gas-filled lamp, for although they were similar in appearance the mill type lamp was not gas-filled.

T. P. McGinnis, Pyle National Co., gave some interesting information concerning lamp life tests which his company had conducted on 125 locomotives. He said that by considering the total headlight lamps purchased and dividing the number by the total number of hours burned by all lamps a value of approximately 320 hours of life was obtained. This did not compare favorably with individual test made which showel that 520 hours was frequently secured. The discrepancy shows clearly that many lamp were broken, lost or burned out.

Report on Electric Welding

The report of the Committee on Electric Welding was briefly presented by E. Wanamaker. He stated that it was exceedingly difficult to draw a set of specifications for the reason that there existed so many variable opinions and ideas. Five meetings of the committee had been held and it was expected that a number of additions would be made before the report was presented in its final form in the fall.

Report of Committee on Stationary Power Plants

The committee report on stationary power plants was presented by L. C. Bowes, Rock Island Lines. He emphasized the necessity of distributing the charges made for steam consumption for various railroad purposes. It was a matter which had never received proper attention and was of the greatest importance if any basis for comparison for charges could be arrived at.

Mr. Moore wanted to know if the committee contemplated including methods or a list of items to be used in arriving at power plant costs. He said it was very difficult to get accurate costs of power plant operation.

In reply Mr. Bowes said it was the intention to show what the cost should be so far as labor and materials were concerned, but that interest and depreciation of equipment were very difficult to obtain.

C. Quinn, Norfolk & Western, related his experience with steam flow meters, extending over 15 years. Steam flow meters he said served as an excellent check on steam consumption by various users. The amount of steam used by air compressors he said could be computed from the revolutions of the compressor.

Electric Repair Shop Facilities and Equipment

Mr. Bebout presented briefly the report of the Committee of Shop Facilities and Equipment. In connection with this report Mr. Quinn described the system in vogue on the Norfolk & Western regarding the record of motors. Each motor, he said, was given a number indicating the month and year that the equipment was purchased. A complete record was then available, no matter how many times the motor was transferred from one place to another.

Power Trucks and Tractors

The report of the committee on Power Trucks and Tractors was presented by Mr. Moore. He stated that considerable difficulty was encountered in securing cost data for the reason that many roads did not keep complete records. Industrial concerns using this equipment were very much better in this respect and most of his

cost data had been secured from them. The gasoline tractor, he said, should be included in the report of the committee, as the subject did not specifically state that electric tractors alone should be included. Some diversity of opinion developed as to the attitude of insurance companies relative to the gasoline equipment. It was found that in some cases this equipment was used in buildings and while not specifically prohibited was not recommended for interior use. For long hauls where a greater portion of the route was out-of-doors, it was felt that the gasoline tractor could be used to advantage.

Report of Committee on Train Lighting

The report of the Committee on Train Lighting was presented by Mr. Billau, who drew particular attention to the essentials for direct drive for car lighting generators, which formed a very important part of the report. It was evident from the interest manifested that the time had arrived when the subject of direct drive should receive the most careful consideration and thought. Although a number of devices have been developed by different companies, none has been tried a sufficient length of time to warrant its general adoption. There is obviously a pressing need for some reliable device especially in northern latitudes where belt trouble is excessive.

The barrel type axle pulley recently adopted by the Pullman Company was discussed at some length. Mr. Sloan related his experience with this type of pulley in some tests conducted on a curved track with radius of 247 ft. The pulley in question was 18 in. in diameter in the middle, 16 in. at the ends and was 28½ in. long. Under the most adverse conditions the belt did not come nearer than 1½ in. from the pulley flanges. To mount such a pulley he stated took 18 minutes, and five minutes were required to remove it.

Locomotive Headlights and Classification Lamps

The report of the committee on Locomotive Headlights and Classification Lamps was presented by L. C. Mulheim, supervisor of headlight equipment, Baltimore & Ohio. Mr Mulheim added to the report by speaking of the possibilities of alternating current headlight generators and also roller bearings for headlight sets. The matter of lamp voltage rating which stumped the A. R. A. discussion of the same report was threshed out by the A. R. E. E. members and the decision reached that the matter was a question of operation, governor adjustment and depended largely upon what was expected from the cab lamps with respect to life and candle power. C. H. Quinn, chief electrical engineer, Norfolk & Western, told how he has greatly reduced his cab lamp costs without any complaints regarding lack of illumination in the cab by using carbon lamps.

E. Wanamaker, electrical engineer, Chicago, Rock Island & Pacific, introduced the subject of automatic train control and showed why the A. R. E. E. should take part in activities relating to the subject. He stated that the A. R. E. E. could undoubtedly co-operate with the Air Brake Association on this subject.

After the presentation of reports, a very able paper on the subject of Electric Heating was read by B. F. Collins of the General Electric Company. Metallic resistor furnaces of all kinds and sizes can be supplied for purposes requiring temperatures up to 2000 deg. F. A vote of thanks was extended to Mr. Collins.

Chairman MacNab concluded the meeting by complimenting the association on its work and calling attention to the fact that it was the most successful and the largest semi-annual convention ever held by the A. R. E. E.

Lost and Found

LOST—Silver mesh bag by Mrs. B. V. H. Johnson of St. Louis. Kindly return to Secretary Conway's office.

Enrollment Today

THE ENROLLMENT booth at the entrance to the Million Dollar Pier will be open from 9 a. m. to 12 m; 2 p. m. to 5 p. m. There will be no enrollment period in the evening today.

Registration Figures

THE COMPARATIVE registration figures for 1922 and 1920 up to 5 o'clock Monday afternoon are as follows:

	1922	1920
Div. V—M. M. and M. C. B.	950	805
Div. VI—Pur. and Stores	333	406
Special guests	800	687
Supply men	2,285	2,465
Railroad ladies	924	746
Supply ladies	569	660
Totals	5,861	5,769

Last Registration Book

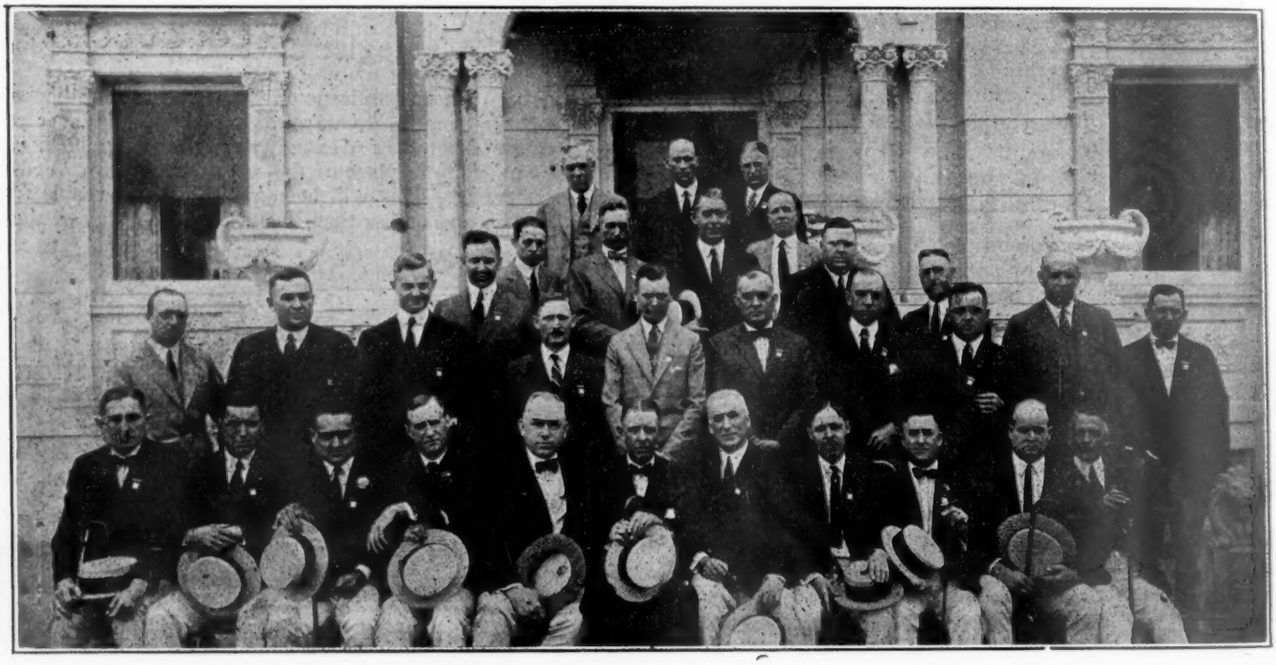
IT HAD been planned to issue only two registration books this week—one on Monday and one Wednesday. The executive committee decided yesterday to publish a book this morning in place of the one scheduled for Wednesday morning. This will be much more serviceable to the exhibitors and others than if issued the last day of the meetings.

Registration, American Railway Association

Division V—Mechanical

Adamson, C. W., M. C. B., Interboro R. T., Chalfonte.
Ahern, W. J., Gen. For., C. & O., Alamac.
Allen, G. S., M. M. Retired, P. & R., Pennhurst.
Anderson, H. P., Asst. to Ch. Op. Off., M. K. & T., Chelsea.
Baker, Geo. H., Pres., Ry. Ed. & Assn., Shoreham.
Balldo, F. E., S. S., N. Y. N.N. & H., Haddon Hall.
Band, F. W., Genl. Shop Insp., B. & M., Chelsea.
Benning, F., G. S., So. Bflo., Wiltshire.
Berger, John, Sp. Eng., N. Y. C.
Bingham, C. E., Sup. Mech. Exam., M. C., St. Charles.
Bodemer, C. J., Asst. S. Mchy., L. & N., Chalfonte.
Borell, E. A., Engr. M. P., P. & R. Bothwell.
Boyd, J. W., Supvr. Elec. Welding, B. & O., Chalfonte.
Boyer, H. A., M. E., Erie, Haddon Hall.
Bradbury, O. H., A. B. Instr., Southern, Shelburne.
Brady, J. E., Asst. M. M., B. & O., Lamar.
Brewer, H. W., S. S., B. R. & P., New England.
Brown, M. G., M. M., M. S. B. & P., Terminal.
Brown, Wallace W., Gen'l Fore. Recl. Plant, B. & M., Colonial.
Broyden, J. E., S. M. P., A. C. L., Princess.
Budwell, Leigh, M. E., R. F. & P.
Burkley, H. J., M. M., B. & O., Schlitz.
Burrell, W. G., Stationery Agt., G. T., Runnymede.
Buskirk, J. H. Van, M. E., N. Y. C., Chalfonte.
Butler, F. A., M. M., B. & A., Chalfonte.
Butler, F. M., Supt., E. B. T. R. R. & C. Co.
Butler, J. L., M. M., M. P.
Butler, T. F., M. M., Penn., Craig Hall.
Byron, A. W., M. M., Penn., Marlborough.
Caley, G. W., M. M., N. Y. C., Fredonia.
Callahan, P. J., Supr. Car & Loco. Elec. Ltg., Colonial.
Carman, J. H., G. F. C. D., N. C. & St. L., New England.
Carr, T. L., Genl. Fore., Penn., Craig Hall.
Carty, F. J., M. E., B. & A., Alamac.
Chaffin, N. B., M. M., Penn., Fredonia.
Chambers, W. C., M. M., Wabash.
Coburn, H. S., G. F., Penn.
Coddington, H. W., Eng. of Tests, N. W., Chalfonte.
Collett, R., Supv. Fuel Economy, N. Y. C., Traymore.

Conahan, C. F. C., M. M., L. V., Pine Hall.
Cooper, Arthur, Sr., Asst. C. M. Eng., United Rys. of Havana, Brighton.
Courtney, J. T., Road Fore. of Eng., F. E. C., Lexington.
Crabbs, W. J., M. E., West Maryland, Morton.
Cromwell, E. G., Spec. Insp., B. & O., Wiltshire.
Curry, Geo., Membr. M. C. B., Am. L. Co., Traymore.
Dailey, F. J., M. M., Erie, Breakers.
Daley, J. H. M. M., N. Y. N. H. & H., Haddon Hall.
Daniels, F. A., Road Fore. of Engs., F. E. C.
Dater, D. N., M. M., P. & R.
Davies, S. R., Fore. Air Brakes, Southern, Breakers.
Davis, A. J., M. M., Erie, Breakers.
Davis, Berton H., M. M., D. L. & W., Alamac.
Davis, J. E., M. M., H. V., Traymore.
Davis, W. R., R. F. E., T. & O. C., Haddon Hall.
Deems, W. A., M. M., B. & O., Ambassador.
Denser, J. M., Air Brake Instr., Penn., Craig Hall.
Depue, Geo. T., M. S., Erie, Ritz.
De Salis, J. H., M. M., N. Y. C., Pennhurst.
Devey, T. S., S. S., Erie, Arlington.
Dixon, A., Genl. For., C. P., Chalfonte.
Dixon, W. J., Asst. M. M., B. & O., Elberon.
Dobson, F. L., M. M., Penn., Chalfonte.
Doke, G. E., Engr. of Tests, N. Y. C.
Donaldson, T. C., M. M., B. P. & P., Strand.
Duke, W. D., Gen. Mgr., R. F. & P., Runnymede.
English, W. M., M. M., C. I. & L., Glaslyn Chatham.
Ewing, J. J., M. E., C. & O., Seaside.
Feeny, B. J., Travel. Engr., I. C., Haddon Hall.
Fetters, A. H., M. E., U. P., Traymore.
Firnhaker, E. R., Air Brake Fore., N. Y. O. & W., New England.
Flinn, R. N., M. M., Penn., Craig Hall.
Foran, Thos., Air Brake Insp., L. V., Arlington.
Fravel, Geo. B., S. M. P., Penn., Dennis.
Fromm, A. B., S. S., I. H. & B., New England.
Gallagher, F. S., Engr. Roll. Stock, N. Y. C., Traymore.
Gallagher, John E., Road Fore. of Eng., P. & R., Martinique.
Gardner, C. C., Jr., M. M., Penn., Brighton.
Gelhausen, F. R., M. M., B. & O. Haddon Hall.
Gilles, W. H., Gen. Fore., Elec. Equip., L. I., Haddon Hall.
Gillespie, H. C., M. M., C. & O., Chelsea.
Gillis, H. A., Retired Eng., Seaside.
Glenn, J. H., R. F. of E., P. & W. V., Sterling.
Good, G. W., S. S., M. C., Haddon Hall.
Goodin, Geo., Genl. Car Fore., M. C. & S.
Goodrich, Max, M. M., N. Y. C., Sebeaun.
Graef, C. S., Supvr. Elec. Welding, B. & O., Chalfonte.
Gray, B. H., S. M. P., Gulf Mob. & North., Strand.
Gray, C. B., M. M., Penn., Traymore.
Greenwood, H. F., S. S., N. & W., Brighton.
Grinshaw, F. G., S. M. P., Penn.
Gross, E. G., M. M., A. & W. P., Blackstone.
Hall, C. S., M. M., B. & M., Chelsea.
Hall, M. A., S. of Mach., K. C. S., Traymore.
Hanlin, I. J., M. M., S. H. L., Princess.
Haupt, H. H., Asst. Eng. M. P., Penn.
Haynee, T. F., Asst. Eng. M. P., Penna., Craig Hall.
Headington, R. V., Genl. For., Penn., Princess.
Hildreth, Fred. F., Asst. Engr. M. P., P. C. C. & St. L.
Hines, F. D., Genl. Loco. Insp., P. & R.
Hitch, C. B., M. M., C. & O., Alamac.
Hofammann, K. E., Asst. Eng. of Tests, W. J. & Seashore.
Holder, J. A., Genl. Master Boiler Maker, S. A. L., Chelsea.
Hollingsworth, F. A., Arch., F. E. C., Strand.
Hopkinson, J. M., M. M., S. & A., Alamac.
Hull, G. A., Asst. M. E., C. R. I. & P., Chalfonte.
Hunt, Robert, M. E., S. A. L., Traymore.
Irvin, I. B., M. M., P. S. & N., Terminal.
Jackson, W. S., M. S., Erie, St. Charles.
Jefferson, M., M. M., L. V., Princess.
Jenkins, E. M., M. E., Virginia, Traymore.
Jenks, W. J., Gen. Man., N. & W., Marlborough.
Jennings, J. F., Asst. Supt. M. P., M. C., St. Charles.
Jones, C. D., V. P., E. Broad Top R. R. Co.
Jones, Geo. C., Gen. Road Fore. of Eng., A. C. L., Bothwell.
Kerby, F., Supr. Loco. Oper., B. & O., DeVille.
Knott, F. W., Shop Supt., S. A. L., Princess.
Laizure, Lee R., Gen. Supt., Erie, Arlington.
Laking, Ed., Air Brake Supvr., C. & E. I., Bothwell.
Langton, Geo. H., M. M., Virginian, Marlborough.
Lanning, H. H., M. E., A. T. & S. F., Chalfonte.
Leonard, L. P., Air Brake Insp., Penn., Seaside.
Leonard, W. E., Air Brake Insp., Soo, Ferdinand.
Leppinglon, William, Asst. Night Fore., C. R. R. of N. J., Edison.
Lingenfelter, C. F., Ch. A. B. Insp., Penn., Seaside.
Lotz, H. B., M. M., Penn., Byron.



"Courtesy George A. McKeague, Official Photographer."

Transportation Committee

Bottom row, left to right: W. Hickey, Magnus Metal Company; J. J. Norton, Globe Seamless Steel Tubes Company; H. S. LeBarge, H. B. Channon Company; W. A. Housten, Joseph Dixon Crucible Company; T. H. Williams, Chicago-Cleveland Car Roofing Company; H. E. Daniels(chairman), West Disinfecting Company; W. B. Ross, Edwin S. Woods & Co.; J. A. McFarland, Bradford Draft Gear Company; C. Beaumont, Boss Nut Company; R. R. Wells, The U. S. Metalic Packing Company; A. H. Weston, T. H. Symington Company; H. P. Cook, Columbia Nut & Bolt Company.

Second row from bottom: Ralph Brown, The Curtain Supply Company; E. C. Folsom, The Railway Materials Company; W. F. Walsh, Galena Signal Oil Comapny; C. J. Holland, The Wine Railway Appliance Company; G. H. Snyder, American Steel Foundries; A. Roberts, Grip Nut Company, K. M. Hamilton, The Bettendorf Company; George Hannaway, The National Refining Company; A. L. McNeill, Central Electric Company.

Third row from bottom: F. J. Coolidge, Buckeye Steel Castings Company; W. S. Atkinson, Cook Paint & Varnish Company; J. F. Comee, Hutchins Car Roofing Company; G. S. Turner, Harry Vissering & Co.; F. M. Condit, Fairbanks, Morse & Co.; J. H. Trent, Johns-Manville, Inc.; R. R. Porterfield, The Superheater Company.

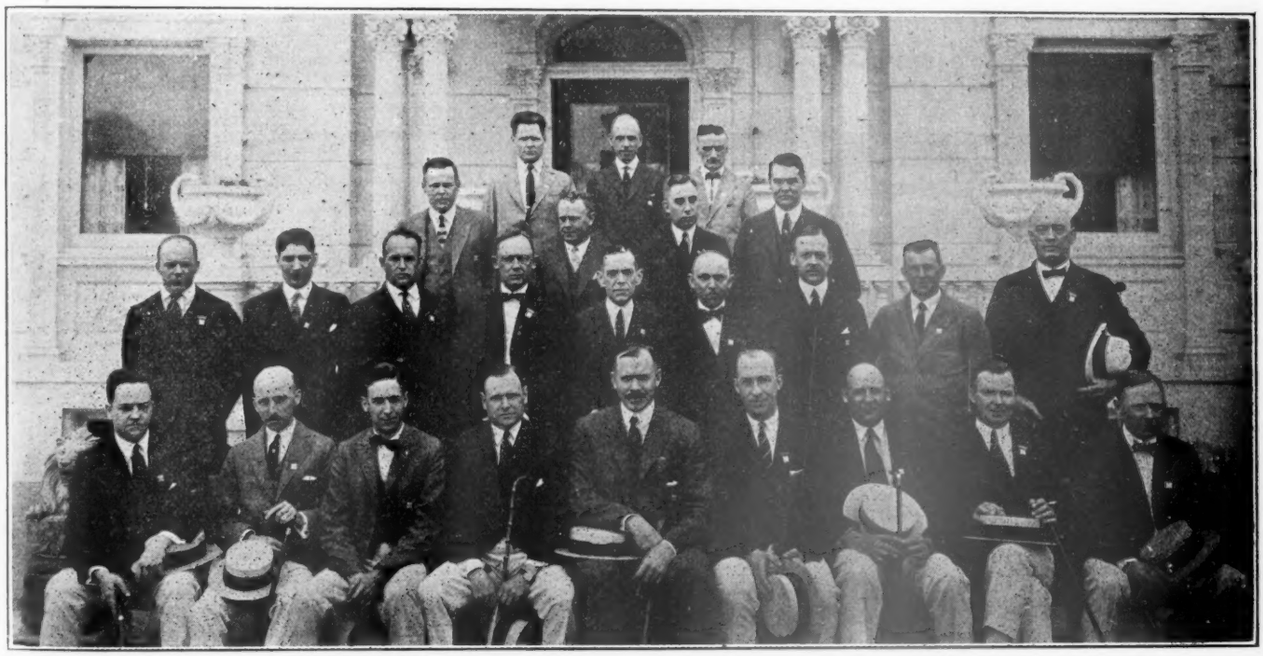
Top row: C. D. Derby, The Joyce-Cridland Company; L. B. Miller, U. S. Metallic Packing Company; C. H. Gaskill, Baldwin Locomotive Works.

Missing: G. E. Anderson, The Duff Manufacturing Company; G. R. Boyce, 3rd, A. M. Castle & Co.; T. F. Clifford, Globe Seamless Steel Tubes Company; H. A. Clark, The Garlock Packing Company; Frank B. Flinn, Griffin Wheel Company; F. E. Finley, LacLede Steel Company, St. Louis; E. J. Fuller, Hunt-Spiller Manufacturing Corporation; J. N. Gallagher, O'Malley-Beare Valve Company; E. L. Georger, Pratt & Lambert, Inc.; C. J. Gorman, Union Draft Gear Comapny; J. W. Hackett, The Okonite Company; W. J. King, Hewitt Rubber Company; G. J. Lawrence, J. B. Ford Company; Floyd K. Mays, Bradford Draft Gear Company; G. A. Murphy, Magnus Metal Company; H. A. Pastre, Liberty Manufacturing Company; T. J. Powell, Galena Signal Oil Company; H. D. Richardson, American Steel Foundries and S. C. Watkins, Southern Wheel Company.

Love, Dumont, Supt., Air Brakes & Fuel Supt., F. E. C., Lexington.
MacMillan, Fred. L., Supr. of Mat., N. Y. C., Fredonia.
Macnab, E. S. M., Car. Lt. Eng., C. P., Craig Hall.
McIlvaine, C. L., S. M. P., Penn., Traymore.
McSweeney, F. J., M. M., B. & O., Haddon Hall.
Madden, T. P., Trav. Boiler Insp., M. P.
Mailer, J. I., S. M. P., Ft. Smith & West., Traymore.
Marriott, F. I., Chf. Drafts., C. & O., Seaside.
Maxfield, F. G., Genl. Fore., B. & O., Sterling.
Mellin, C. J., American Loco. Co., Marlborough.
Metzger, Louis, Gen. Loco. Insp., Erie, Arlington.
Miller, H. C., Div. Store., B. & O., New England.
Miller, R. W., Asst. Eng. Office Mech. Eng., West J. & Seashore.
Mohun, John L., Mech. Office Asst. to Pres., U. P., Traymore.
Moll, G., Rd. Fore. of Eng., P. & R., New England.
Monroe, J. W., M. M., Penn., Princess.
Moore, Wm., S. S., Erie, Arlington.
Moran, R. P. T., Head. Supr., B. & O., Craig Hall.
Moriarity, G. A., M. S., N. Y. N. H. & H., Chalfonte.
Murphy, J. W., G. F., E. & A., Ambassador.
Morris, John S., Asst. Eng., Nickel Plate, Alamac.
Murray, F. N., Mech. Supt., Erie, Arlington.
Needham, H. S., Asst. M. M., Penn., Craig Hall.
Neesley, F. P., Div. M., M. C., St. Charles.
Nelson, F. W., M. M., N. H., Traymore.
Nelson, Wm., M. E., K. C. & So., Traymore.
Norton, C. N., M. M., Erie, Arlington.
Onerdonk, J. R., Eng. of Tests, B. & O., Marlborough.
Page, Chas. N., R. F. of E., L. V., Arlington.
Parson, C. F., M. H., N. Y. C., Haddon Hall.
Parson, J. G., S. S., N. Y. C., Haddon Hall.
Pegg, M., Sr., D. S., United Rys. of Havana, Brighton.
Peters, D. F., Sup., N. & W., Marlborough.
Pickrell, W. J., M. M., C. P., Strand.
Pohlman, Wm., Genl. Fore. Loco. Shops, O. & W. (Middletown), New England.
Porter, W. B., Asst. Engr. M. P., Penna., Miller.
Quinn, J. H., G. F., Penn.
Reese, O. P., Supt. M. P., Penn., Brighton.
Rhoads, Geo. A., Asst. M. M. East. Div., Penn., New England.
Rhodes, Robert S., Asst. Engr., N. Y. C., Runnymede.
Richardson, E. E., Asst. to Engr. of M. P., B. & L. E., St. Charles.
Richers, G. J., M. M., Penn., Traymore.
Riegel, S. S., Mech. Engr., D. L. & W., Arlington.
Ritter, O. H., M. M., N. Y. N. H. & H., Traymore.
Robertson, Geo. W., M. M., B. & O., Alamac.
Roy, E. H., M. M., S. A. L., Alamac.
Rudd, W. B., Asst. Engr. M. P., Penn., Haddon Hall.
Rusling, W. J., Asst. Eng. M. P., Penn.
Sasser, J. W., S. M. P., Virginian, Marlborough.
Scheifle, John, Road Fore. of Eng., P. & R., New England.
Schneider, G. A., M. M., Penn., New England.
Schwindy, H. H., Genl. For., Penn., Craig Hall.
Sechrist, T. O., Asst. S. M., L. & N., Chalfonte.
Seddon, E. F., G. F., L. Y., Edison.
Seibert, W. G., G. M. M., N. P., Majestic.
Shull, C. O., Insp. M. P. Dept., Penn.
Slater, Jos., M. M., Erie, Breakers.
Smith, G. W., M. M., Wabash, Alamac.
Sneck, Harry, Supv. of Air Brakes, B. R. & P., Pennhurst.
Snell, E. J., M. M., N. Y. C., New England.
Spaide, Geo. S. W., Fore., Atlantic City R. R.
Stayton, C. E., Dist. Fore., U. P., Arlington.
Steins, C. K., Asst. Engr. M. P., Penn., Morton.
Stevens, H. R., M. M., A. C. L., Ambassador.
Stubbs, C. M., Sp. Insp., Erie, Breakers.
Stumpf, F. L., Air Brake Instr., Penn., Princess.
Sugg, C. R., Elec. Engr., A. C. L., Ambassador.
Sutherby, A., M. M., Med. M. C., Ambassador.
Swanick, Arthur, G. F., W. J. & S. S.
Tate, M. K., Mgr. of Serv., Lima Loco. Works, Chelsea.
Thibaut, Geo., M. M., Erie., Arlington.
Thomas, F. W., Sup. Appre., Santa Fe, Chalfonte.
Tuma, F., M. M., Erie, Arlington.
Walther, H. J., S. M. P., R. F. & P.
Waring, F. M., Eng. of Tests, Penn., Haddon Hall.
Watson, R. B., Engr. of Tests, Erie, Haddon Hall.
Webb, E. R., Div. M. M., M. C., Haddon Hall.
Weedon, R. E., Supt. Roadway Shops, Southern, Traymore.
Westbrook, M. H., Supt. Loco. Shops, G. T., New England.
White, J. F., Air Brake Supvr., Penn., Seaside.
Wiggin, C. H., Sup. M. P., B. & M., Chelsea.
Williams, A. J., Gen. Air Brake & St. Heat Insp., Penn., Seaside.
Wilson, D. M., Shop Supr., F. E. C., Sterling.
Wood, H. R., Store., Penn.
Woolover, W. B., Act. M. M., L. V., Princess.
Yaeger, J. P., Gen. Car Fore., P. S. & N.
Zimkowski, Frank, Gen. Car Ligh. Inc., N. Y. N. H. & H., Colonial.

Division VI—Purchase and Stores

Adams, R. H., Asst. P. A., L. A. & S. L., Traymore.
Alexander, C. W., G. S., C. of Ga., Ambassador.
Austin, Frank S., G. S., B. & A., Chalfonte.



"Courtesy George A. McKeague, Official Photographer."

Entertainment Committee

Bottom row, left to right: W. R. Walsh, The Glidden Company; R. L. DeArmond, Lowe Brothers Company; A. R. Miller, B. F. Goodrich Rubber Company; O. C. Hayward, Williams-Hayward Company; R. J. Himmelright (chairman), American Arch Company, Inc.; A. G. Johnson, Armspear Manufacturing Company; H. A. Varney, Sunbeam Electric Manufacturing Company; W. J. Carrigan, International Machinery & Supply Company, Ltd.; C. R. Naylor, T. H. Symington Company.

Second row: S. W. Sargent, American Steel Foundries; F. W. Venton, Crane Company; G. W. Taylor, The R. T. Jones Lumber Company, Inc.; C. L. Brown, Manning, Maxwell & Moore, Inc.; R. P. Cooley, Vapor Car Heating Company; J. J. Cizek, The Leslie Company; A. N. Dugan, Bronze Metal Company; W. G. Krauser, Union Draft Gear Company; D. L. Eubank, Galena Signal Oil Company.

Third row: L. J. McCombs, The Patterson-Sargent Company; G. A. Nicol, Jr., Johns-Manville, Inc.; C. W. F. Coffin, Franklin Railway Supply Company; W. G. Cook, Garlock Packing Company.

Top row: C. M. Rogers, Locomotive Firebox Company; G. E. Haas, Pyle-National Company; J. W. Fogg, Boss Nut Company

(Missing: L. O. Cameron, Edgewater Steel Company; W. J. Doherty, Continental Iron & Steel Company; C. D. Eaton, American Car & Foundry Company; W. A. McWhorter, Bradford Draft Gear Company; N. C. Naylor, Railway Steel-Spring Company; Leslie R. Pyle, Locomotive Firebox Company; W. M. Wilson, Flannery Bolt Company.)

Baldwin, R. W., Store., Penn., Elberon.
Batee, Walter W., Material Supvr., C. M. & St. P., Haddon Hall.
Beddees, M., Asst. Store., Penn., Deville.
Bennett, J. L., P. A., C. of Ga., Traymore.
Blackburn, R. M., Gen. Store., C. & N. W., Chelsea.
Blyth, W. S., Insp. Canadian Ry. Com., Haddon Hall.
Bodle, E. C., Store., Penn., Martinique.
Brain, B. B., P. A., K. C. S., Ambassador.
Breene, J. P., C. S. K., N. C. & St. L., Shelburne.
Browne, C. S., Store., A. C. L., St. Charles.
Browne, O. L., Asst. to P. A., A. C. L., St. Charles.
Burleigh, O. T., Trav. Store., B. R. & P., Breakers.
Buxser, A. E., S. K., W. & L. E., Breakers.
Cleveland, F. P., Div. Store., L. V., Monticello.
Cooke, G. R., Asst. P. A., C. M. & St. P., Traymore.
Cooley, Le Roy, C. S., C. R. R of N. J., Haddon Hall.
Cox, Arthur E., Gen'l. Store, West. Lines, C. N., Chalfonte.
Cragin F. E., Div. S. E., U. P., Traymore.
Dale, A. R., G. S. K., F. E. C., Shelburne.
Daniel, A. D., P. A., Atl. Birm. Atl., Ambassador.
Dibble, C. C., S. of S., N. Y. C., Traymore.
Dickinson, T. R., Div. Store., B. & L. E., St. Charles.
Dittoe, W. P., P. A., Nickle Plate, Ambassador.
Ector, W. L., Div. S. K. Cent. of Ga., St. Charles.
Erb, Chas. W., Div. Store., Penn.
Ernst, E. A., Dist. Sk., C. R. I. & P., Traymore.
Fisher, Omar D., Div. Store., Penn., DeVille.
Fitzpatrick, W. H., Trav. Storekeeper, C. & N. W., Chelsea.
Fox, Emmory W., Stockman, Penn., Martinique.
Genther, J. S., Gen. Store., L. & N. E., Pennhurst.
Gerber, J. W., Genl. S. K., Southern, Breakers.
Gordon, W. P., Div. Store., G. T., Chelsea.
Gorsuch, J. W., Insp. of Stores, Penn., Blackstone.
Green, S. C., Dist. Store., L. V., Monticello.
Hegeman, T. J., Trav. Supr., C. B. & I., Craig Hall.
Hench, C. F., Asst. S. K., Penna., Albourne.
Hill, John P., Div. Store., Penn.
Hiner, W. J., P. A., C. C. C. & St. L., Marlborough.
Hobson, J. E., Stationer., Southern, Craig Hall.
Hubbell, C. C., P. A., D. L. & W., Seaview Country Club.
Hubbell, R. B., P. A., Inter. Ry of Cent. Amer., Ambassador.
Hughes, E., Gen. Store., K. C. S., Ambassador.
Hull, F. A., T. S. K., N. Y. N. H. & H., Dennis.
Hunt, Wm., Gen. S. K., W. & L. E., Breakers.
Hutson, W. C., Div. Store., Breakers.
Hyatt, L. V., Insp. of Stores, M. P., Clarenden.
Irish, J. L., Genl. S. K., O. W. R. R. & N., Traymore.
Johnston, C. E., Store., B. & A., Chalfonte.
Jones, Morris C., Store., Penn., Fredonia.
Kelly, C. H., Dist. Store., L. V., Monticello.
Kelly, J. T., Dist. Store., C. M. & St. P., Chalfonte.
Kemmerling, B. B., Dist. Store., Penn., Princess.
King, D. C., Gen. Store., Virginian, Traymore.
Kinkey, W. M., Supvr. of Mat., B. & O., New England.
Kinnear, C. W., Genl. Store., Penn., New England.
Kohler, L. G., Div. Store., B. & O., Blcakstone.
Kyle, C. C., Gen. Store., N. P., Traymore.
Lance, I. H., Gen. Store., D. L. & W., Chalfonte.
Lehrach, G. H., S. K., Penn., Ambassador.
Livingston, Jno. B., Div. Store., S. T., Chelsea.
Mackie, C. J., S. K., C. B. & V., Craig Hall.
Marceau, J. E., G. S. K., Rutland, Blackstone
McAndrew, R., G. Sk., B. & L. E., St. Charles.
McGrath, Frank, Trav. Store., B. & M., Colonial.
McKaig, W. J., Div. Store., L. V., Monticello.
McMahon, J. E., Gen. Store., C. St. P. M. & O., Seaside.
McCarthy, John H., Dist. Stkpr., Penn., Dennis.
McCarthy, Judson D., P. A., Minn. & St. L., Ambassador.
Meyers, S., Gen. Store., L & H., Haddon Hall.
Miller, W. A., Div. S. K., Southern, Princess.
Mills, O. B., Gen. Store., Penn. S. W. Region, Ambassador.
Minter, O. H., Store., A. B. & A., Ambassador.
Mitchell, C. H., S. K., Penn., Albermarle.
Moore, Tom., P. A., Virginian, Traymore.
Morris, Wm. J., P. A., Portland Ry. Light & Power Co.
Morris, Wm. W., P. A., Penn. Chelsea.
Morrison, I. G., Store., C. B. & Q., Craig Hall.
Mullen, D. J., S. M. P., Big 4, Traymore.
Munster, A. W., P. A., B. & M., Ritz Carlton.
Murphy, F. A., Dist. Store., B. & O., Shelburne.
Nelson, O., Genl. Store., U. P., Traymore.
Nicodemus, E. N., Material Agent, Penn., Ambassador.
Nonemaker, C. L., Stock Fore., Penn., New Somerset.
Orlinger, R. J., Asst. R. F. of E., Penn., Silverton.
Oswalt, N. L., Asst. Wks. Store., Penn., Elberon.
Parker, C. A., Div. S. K., A. T. & S. A., Craig Hall.
Polk, E. H., Dis. Store., S P., Ambassador.
Quigley, C. V., Store., Ann Arbor, New England.
Ray, H. C., Dist. Store., Penn., Ritz.
Reed, D. H., Div. Store., Southern, Breakers.
Reynolds, D. E., Ch. Clk. & P. A., B. & L. E., Pennhurst.
Reynolds, F. W., Div. Store., B. & O., Shelburne.
Rice, G. W., Div. Store., I. C,. Dennis.
Richards, Geo. T., Dist. Store. C. M. & St. P., Fredonia.
Rock, D. E., Mat. Agent, Penn., Ambassador.
Rouse, R. T., P. A., R. F. & R., Runnymede.
Satchell, N. L., Storekeeper, N. Y. Ont. & West, Haddon Hall.
Schmehl, Wilson H., Asst. Store., P. & R.
Schoemaker, H., S. K., B. & O., New England.
Scott, G. W., Store., M. K. & T., Traymore.
Sebers, Carson, Dist. Store., M. K. & T., Traymore.
Sheehan, M. L., Store., B. & A., Chalfonte.
Sidey, W. J., Storekeeper, B. R. & P., New England.
Singleton, A., P. A., H. V., Traymore.
Smith, C. C., Pur. Agt., U. P., Marl.
Snyder, G. W., Gen. Store, East Div., Penn.
Sowell, A. W., Div. Store., C. of Ga., Ambassador.
Stackpole, W. S., Gen. Store., Public Service Rwy. Co., Haddon Hall.
Stewart, K. R., Dist. Store., Coast Line, Santa Fe, Traymore.
Strong, J. M., Store., Penn., Ambassador.
Studer, L. L., Div. Store., M. P., Carlton.
Sullivan, J. L., Trav. S. K., U. P., Traymore.
Tillett, A. A., Insp. of Stores, Penn.
Thompson, Howard M., Store., Penn., Iroquois.
Thompson, L. C., Gen. Store., Can. Nat. Rys., Alamac.
Thorpe, E. G., Gen. Store., L. I., Pennhurst.
Tobey, C. B., Gen. Store., L. V., Alamac.
Tredeck, W. S., Asst. Pur. Clerk, Penn.
Turner, Geo. P., Trav. S. K., Southern, Breakers.
Wagner, E. R., M. of W. Store., Penn., Blackstone.
Ward, W. M., Engineman, Penn., Elberon.
Ware, W. C., Dist. Store., B. & O., Haddon Hall.
Watkins, John W., Trav. Store., L. V., Monticello.
Watson, R. P., Div. Store., C. of Ga., St. Charles.
White, C. D., S. K., Penn., Princess.
Wiggett, G. W., S. K., C. & O.
Williams, D. A., Asst. P. A., B. & O., Strand.
Wood, L. B., Gen. S. K., S. P., Alamac.
Workman, E. A., Dist. S. K., B. & O., New England.
Zimmer, John A., Store., Penn., Princess.

Special Guests

Adair, John G., Exam. Dept. of Equip., U. S. R. A., Blackstone.
Anderson, A. L., Eng. House Fore., L. I.
Anderson, Allan R., Chelsea.
Anderson, M. D., Pipe Fitter, C. & O., Y. M. C. A.
Anderson, R. E., Air Brake Instr., C. & O., Seaside.
Antone, Wm. E., Engr., Sou., New England.
Arnold, H. M., Travel. Account., P. & R.
Baugher, J. M., Fore. Interior, Penn., New Clarion.
Beatty, William, C. C. to Purch. Agt. East. Reg., Penn.
Bebout, C. W., Elec. & Shop Eng., C. & O., Chalfonte.
Bennett, J. L., Jr., Traymore.
Benson, I. N., Supvr. of Motor Cars, New Haven.
Bergen, Fred Von, Ch. A. B. Insp., N. C. & St. L.
Bevan, T. D., Supt. Power Plant, C. R. R. of N. J., Haddon Hall.
Billings, Grant, Air Brake, B. & O.
Bingman, F. E., Eng., Penn., Haddon Hall.
Bixby, O. M., Leading Drafts., N. Y. C., Runnymede.
Blackburne, N. E., Instr. of Appren., Erie, Y. M. C. A.
Blankenship, C. M., Air Brake Mach., A. C. L., Princess.
Blomquist, C. A. G., Stores Account, C. of G., St. Charles.
Boath, R. S., Insp. of Loco., Inter. Comm., Princess.
Boeckmann, J., Reporter Op. Div., Am. Ry. Assn., Chalfonte.
Bolling, N., Triple Valve Cleaner & Tester, C. & O., Y. M. C. A.
Bowen, Thomas, Fore. Stores Dept., P. & R.
Brand, F. L., Fore, Misc. Shop, Penn., Kingston.
Brown, E. I., Engineman (ABA), Big 4, New England.
Buchebaum, F. J., Engine House Fore., Penna.
Burgess, G. E., A. B. Instr., L. V., New England.
Burns, James, Foreman, Penn., St. Charles.
Burson, H. A., Chf. Air Brake Inspr., Penn., Princess.
Byerly, Wm. F., Road Fore. of Eng., Ann Arbor, Avon Inn.
Byron, Robert J., Fore., Penn., Marlborough.
Calnan, C. E., Eng., B. & O.
Cardegna, Frank A., Drafts., B. & O., Wellsboro.
Cavin, Wyatt M., Supv'r. Air Brake Rep., A. C. L., Princess.
Caviston, J. C., Secy. Oper'g Div., A. R. A., Chalfonte.
Childress, L., A. Brake Repairer, C. & O., Leedoom.
Clear, C. N., Asst. Road Fore. of Eng., P. & R., Strand.
Cleary, John M., Fore. Eng. House, Penn., Deville.
Coble, G. L., Eng., Sou., Fransconia.
Cohen, J. H., Mach. Apprent., Sou., Y. M. C. A.
Conklin, T. G., Genl. Elec. Insp., D. & H., Ambassador.
Einwaechter, Fred H., Jr., M. Drafts., B. & O., Wellsboro.
Eldor, James, Air Brake Sup., C. M. & St. P., Haddon Hall.
Francis, Howard J., Asst. Fore., P. & R.
Gingell, F. H., Air Brake Instr., D., L. & W., Craig Hall.
Gramm, R., Engr., B. & O.
Hayes, W. N., Fore., R. R., Princess
Holman, W. S., R. H. Fore., A. C. L., Princess.
Hurkel, Geo. C., Drafts., B. & O., Wellsboro.
King, C. G., Stat., U. S. R. A., Marlborough.
Kinhhofer, A., Fore., Air Brake Dept., N. C. & St. L., New England.
Kinnear, Thos., New England.
Lenich, Charles R., Asst. Fore., P. & R.
Livingston, J. F., Elec., Penn., Stanley.
Lohman, Chas., R. H. Fore., C. R. R. of N. J., Edison.
Luers, H. L., Drafts. Mech., B. & O., Wellsboro.

Purchases and Stores Grand Ball

The annual Purchases & Stores Division grand ball will be given on the Pier tonight.

Last Night's Entertainment

LAST NIGHT'S entertainment program on the Pier was especially in honor of those attending the convention of the Purchases & Stores Division, and consisted of informal dancing and vaudeville. Ralph Wander and his partner gave an exhibition dance, and a party of Hawaiian entertainers gave several musical and instrumental selections.

"Dawson's Dancing Wonders", of Atlantic City, gave a carnival dance. One of the best features consisted of the songs of W. B. Ross, who is strictly "home talent", since he is connected with Edwin S. Woods & Co. The committee in charge of the program consisted of J. W. Foss, chairman; R. L. DeArmond, A. N. Dugan, Webb C. Krauser, L. J. McCombs, and Fred W. Venton.

Conventionalities

We would respectfully refer anyone who wishes to study African golf to Frank Hedley.

W. Harold Tyler, who is now connected with the traffic department of the Denver & Rio Grande Western at New York came down to visit his parents, Mr. and Mrs. W. T. Tyler, at the conventions for a few days.

F. N. Bard, who recently succeeded his father as president of the Barco Manufacturing Company, finds it impossible for the first time in many years to attend the convention owing to the pressure of business.

C. D. Young, general supervisor of stores, Pennsylvania Railroad, reached Atlantic City for the conventions Sunday, having stopped at Ithaca on his way here for a two-day celebration of the twentieth anniversary of his graduation from Cornell University.

Dave Pye tells us that he has gotten his golf score down to 125, but he dosen't say for how many holes. He has left with us a blue print showing graphically the functions of the arms and club and just how they move in the golf swing as outlined at certain periods.

I. H. Milliken, representative of the McConway & Torley Company, Pittsburgh, is not here and sends his regrets to inquiring friends. Milliken has been very active at these conventions for a great many years and it is to be hoped he will be on the job next year.

The double quartette from the Philadelphia & Reading shops at Reading, Pa., proved to be one of the best groups of entertainers that have attended the conventions. The singing and other specialties on the pier Wednesday night and Thursday afternoon were greatly enjoyed and appreciated.

Monday being Harry W. Finnell's birthday; and there being no way in which to celebrate it appropriately at Atlantic City, he left in the afternoon for New York to join Mrs. Finnell and some friends to eat and have a merry time there that evening. Mr. and Mrs. Finnell expect to get back to Columbus Saturday.

F. A. Bushnell, purchasing agent of the Great Northern, is accompanied to the Purchases and Stores convention, as in prior years, by his mother. Mrs. Bushnell is "Mother" to many of the members of the Purchases and Stores Division and is always a welcome visitor.

Allen E. Ostrander is missed by a host of friends. He is taking a needed vacation in Arizona, his present address being Prescott. We take this opportunity of congratulating him on his birthday, which occurs on the twenty-third.

Mr. Ostrander has wired the Daily as follows "Please give my regards to the fellows—see you all next year."

"Sid" Wight, manager of purchases and stores of the New York Central, is not attending the convention of the Purchases and Stores Division this year. He went to Europe a few weeks ago to take the first real vacation he has had in about 20 years. His daughter has been living in Switzerland for some time, and he will spend most of his vacation there. He expects to return to the United States about the middle of July.

Among the arrivals Monday were A. Cooper, assistant chief mechanical engineer, and M. Pegg, assistant division superintendent of the United Railways of Havana. As the only representatives of the United Railways of Havana, they are finding much of interest to them at this, their first convention. After leaving Atlantic City Mr. Cooper intends to go to England for a few months rest.

Among the "old timers" and attendants this year is George S. Allen. Mr. Allen, who has reached the ripe old age of 86 years, is a retired master mechanic of the Philadelphia & Reading, having been on the retired list for the past 16 years. He has not missed a convention since 1892 and is a life member of the American Railway Master Mechanics' Association. He expects to meet many friends here this year.

Elisha Lee, vice-president of the Pennsylvania Railroad, Eastern Region, who addressed the Purchase & Stores convention, told *The Daily* yesterday that in spite of the coal strike the Pennsylvania recently has been handling 10 per cent more freight business than a year ago. Considering that the Pennsylvania is a very large coal carrier, this is a remarkable fact. "All indications are," said Mr. Lee, "that when the coal strike is ended and coal begins to move in normal volume, the railways of the country are going to have all the business they can handle, and probably many of them will have more than they can handle."

The carnival on the pier Saturday night proved to be one of the most popular entertainment features ever given at the conventions. It was attended by a big crowd, was entirely informal, and everybody had a jolly time. The "kiddy car" races furnished some excitement and a great deal of amusement, while the "Gypsy Trio" was welcome everywhere. The entire Entertainment Committee was on duty and participated in making the carnival a success. The committee especially in charge was composed of Fred W. Venton, chairman, J. Cizek, assistant chairman, W. G. Cook, R. P. Cooley, R. L. DeArmond, George E. Haas, Arthur G. Johnson, C. R. Naylor, George A. Nicol, Jr., and H. A. Varney.

Speaking of "old timers" at these conventions reminds us of Stephen C. Mason, of The McConway & Torley Company. In the days of souvenirs Mr. Mason always gladdened the hearts of the editors of *The Daily* by leaving a box of cigars on the desk of the editor-in-chief. While those good old days are passed and gone and the editors now have to buy their own cigars, nevertheless it made our hearts glad to welcome Mr. Mason again this year. His perpetual youth is even more invigorating than were his cigars.

J. H. Waterman, superintendent timber preservation of the Burlington, is unable to attend the convention of Division V. this year because of the illness of his wife. The members of the association sent him the following telegram: "Your friends, which embrace all the members of Division VI. of the American Railway Association, at the opening of their third convention learn with deep sorrow that you cannot open our meeting with your benediction. Each of us individually and all collectively offer a silent prayer for helpfulness for your devoted wife's recovery, and with the knowledge that your thoughts are with us as ours are with you."

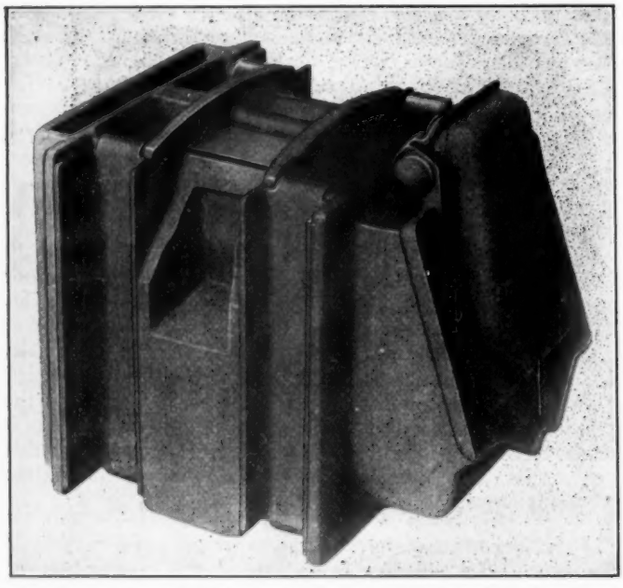
New Devices Among the Exhibits

Passenger Car Journal Box with Renewable Liners

SINCE THE LAST convention, the T. H. Symington Company, New York, has perfected a malleable iron passenger car journal box equipped with renewable pressed steel liners in the pedestal ways and equalizer seat. The grey iron journal box, which is still used extensively notwithstanding its excessive weight and liability to breakage, has been retained primarily because the material of which it is made has a reasonable amount of resistance to abrasion from the pedestal jaws and equalizer bar. The plain malleable iron box, while lighter and much stronger, shows wear in the pedestal ways and equalizer seat more rapidly than the cast iron box.

For many years designers have been endeavoring to develop a type of pedestal way reinforcement which would be economical and effective. This box is designed on the theory that wear is inevitable until there is either leveloped a type of pedestal which will provide for adequate and continuous lubrication or a combination of materials in contact which will greatly reduce the coefficient of friction.

The pedestal way liners are formed of mild or medium steel, of a degree of hardness which will not wear the more expensive pedestal jaws. The liners are heated before application to the box, forced into position and the top and bottom ends clamped securely around corresponding ribs on the box. The equalizer seat liner is either of cast steel or a drop forging case-hardened, fitted



Liners Are Provided in the Pedestal Ways and Equalizer Seat

neatly into a cored recess in the journal box roof and held in position by peening over the surrounding metal.

The liners when sufficiently worn may be easily replaced and a journal box thus equipped should outlast from six to ten sets of liners. Even in cases where the liners wear as rapidly as the plain journal box, the substantial economy of their use is obvious.

Annular Disc Boiler Check

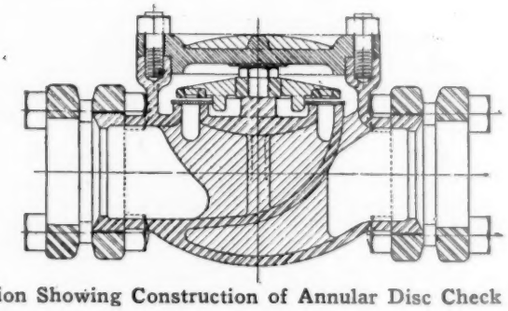
THIS NOVEL FORM of boiler check valve, designed by Wm. Sellers & Company, Inc., Philadelphia, Pa., is intended especially for use in the feed-water line between the boiler and the pump of locomotive feed-water heaters and embodies certain new and interesting features.

The usual type of locomotive boiler check is not adapted for steam actuated feed pumps on account of the intermittent flow of the water and rapid excessive variations of pressure in the pipe line. It is necessarily made heavy and with a lift sufficient to give the required area of flow; in this form of valve, the shock of closing is severe and soon tends to hammer the valve to pieces. It is, therefore, obvious that the lighter the valve and the shorter the lift, the lighter will be the blow on the seat, reducing the amount of repair and increasing the life of the valve.

The present design includes an annular discharge area with two large circumferences of outlet for the feed-

External View of Annular Disc Boiler Check

water; this annular area is controlled by a light, flexible, non-rusting disc valve, having a short lift. The seat on the body is also of a special form which gives the full area of contact when the disc valve is flexed under boiler pressure. An important advantage of this design is that there is less



Section Showing Construction of Annular Disc Check Valve

tendency to destroy the seat or the valve when foreign matter lodges between the two surfaces; a heavy valve, with its momentum proportional to the lift and boiler pressure, striking a heavy blow, tends to drive such material into the metal, destroying the surface and inducing further leakage. The disc valve, on the other hand, seats easily and gently without shock, causing no damage to either surface, so that both seats are cleaned off during the next flow of feed-water.

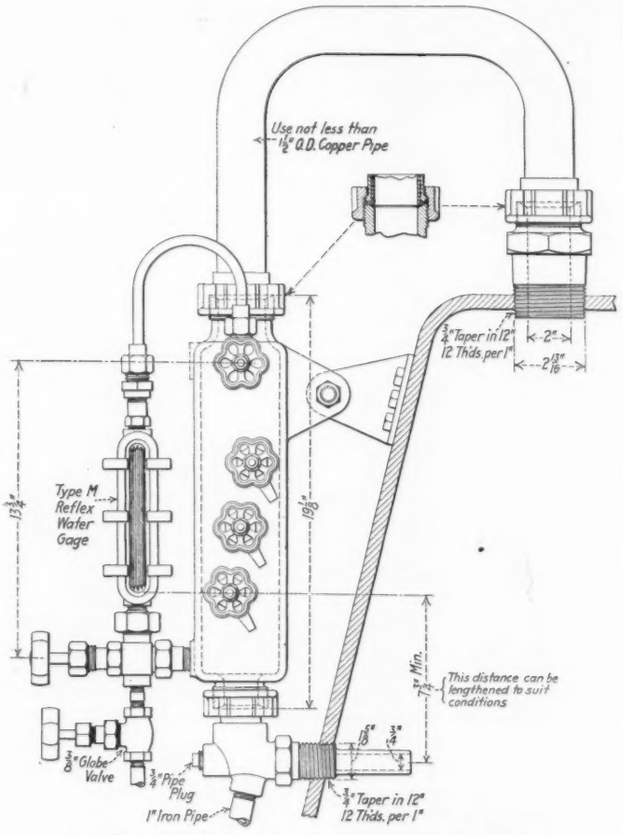
The valve is made at present in the 2½-in. pipe size only. It is interchangeable with the U. S. Government standard locomotive check.

Catenary Hanger

THE WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., has on exhibit a new catenary hanger especially designed for steam railroad electrification. This type of hanger is made of copper and is extremely light, the 12-inch hanger weighing but 8 ounces. The design is such that the hanger rods are not weakened where they are attached to the jaws. A pull of 1600 lb. is required to pull the hanger from the hanger rod and the force required to strip the trolley wire from the jaws is 2000 lb. It is claimed that the hanger will not kink the trolley wire when subjected to blows from the pantagraph running at high speed.

Edna Water Column

A WATER COLUMN for locomotive service which can be relied upon to indicate the actual water level in the boiler is being shown by The Edna Brass Manufacturing Company, Cincinnati, Ohio. As will be noted from the drawing, the upper part of the column is connected to the top of the boiler by a U-shaped piece of copper pipe, at least 1½ in. diameter, while the bottom of the column is connected to the water space. The distance from the lower gage cock and the bottom of the



Edna Water Column Insures Accurate Reading of Water Level

Reflex water gage glass is at least 7¼ in. and may be longer to suit conditions.

The bottom connection of the column is provided with a drain or blow-off cock and a ¾ in. plug, the removal of which permits inspection and cleaning of the water connection. In addition to the three gage cocks the column is regularly fitted with a type M Reflex water gage although a tubular water glass may be substituted if desired. This column meets all of the safety requirements desired by the Bureau of Locomotive Inspection.

Stoker Distributor Tube

A NEW DESIGN OF distributor tube for Duplex Stokers is being shown by the Locomotive Stoker Company, Pittsburgh, Pa. This tube, which is a notable improvement over the old style single-piece casting, is made in three pieces, the top and bottom portions being removable. Should the parts which extend into the firebox

The New Distributor Tube of the Duplex Stoker Is Made in Three Pieces

burn off they can be replaced at small expense and without the necessity of throwing away the tube itself and buying an entire new distributer.

In addition, changes have been made in the shape which give a better distribution of coal than was obtained with the old distributer.

Firefrax Cement

FOR SOME TIME furnace operators have felt the need of a refractory cement having super-refractory qualities to be used in the general repairing and patching of high temperature furnace linings and for laying up brick. The demand has been for a cement that would stand up under the highest temperatures encountered in commercial furnace work—a cement that would not melt, disintegrate or blister. To meet this demand The Carborundum Company, Niagara Falls, N. Y., has developed a new cement known as Firefrax.

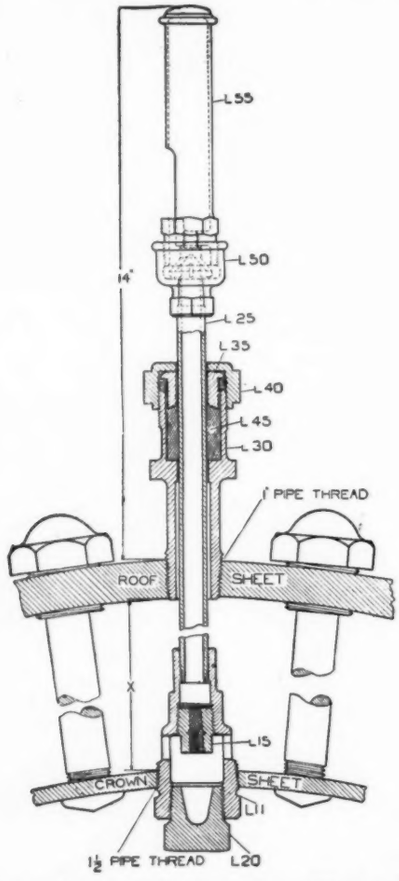
Firefrax cement is a mixture of alumino-silicate materials having extremely high refractory properties. Exhaustive tests have proved that it will stand up under the severe conditions of high temperature work without melting, cracking off or even blistering; and it shows such long life as to materially reduce repair costs and lessen the need of costly shutdowns.

Firefrax cement will quickly harden at room temperature. It lays smooth and it sticks, making it easy for the furnace builder to handle. It sets or hardens at 1472 deg. Fahr. Firefrax is shipped wet ready to use, there being no need of adding any refractory materials to it because it is in itself a super-refractory. This cement can be applied with a cement gun or by ordinary hand methods.

Cleveland Low Water Alarm

THE CLEVELAND low water alarm made by The Talmage Manufacturing Company, Cleveland, Ohio, is a simple fool-proof, reliable device which can be easily applied and cheaply maintained. It consists of a steel cage, ordinarily mounted on the highest point of the crown sheet, from which a copper pipe leads up through a roof sheet stuffing box to a whistle. The crown sheet cage carries the fusible plug which is suspended slightly above the crown sheet and removed from the intense heat and fire-box gases. A closing fire-box plug is screwed into the bottom of the crown sheet cage and furnishes a means for removing the fusible plug.

The fusible plug in the alarm device bears no relation to the fusible plug of common practice which upon melting allows a small jet of steam to blow into the fire-box. In the Cleveland low-water alarm the melting of the fusible plug opens a direct passage way only to the alarm whistle, thereby warning the enginemen of the dangerous condition in the boiler in time for them to replace the



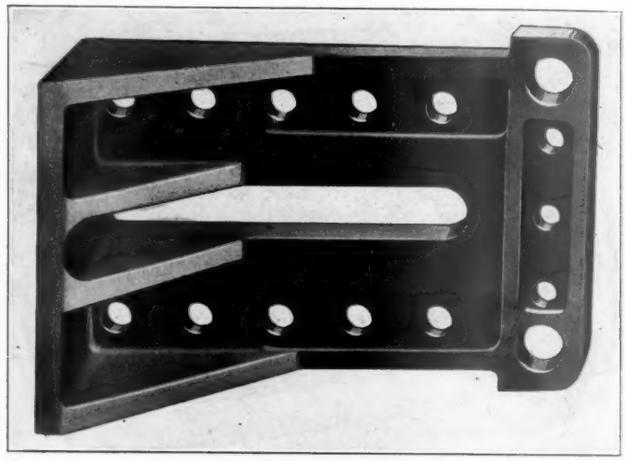
Construction of Cleveland Low Water Alarm

water without any damage to the boiler. After the water rises to a point above the openings in the crown sheet cage, the whistle will stop blowing but the water will continue to escape from the whistle. As the opening in the fusible plug is only ¼ in. in diameter, the loss of water through the whistle does not necessitate killing the engine but acting as a tell-tale it at once fixes the responsibility for low water. The elimination of all levers, valves, springs and moving parts of any description, and the use of a suitable trap for the fused metal in the fire-box plug insures the proper operation of this device while the government requirements concerning fusible plugs at the monthly washouts insures its proper maintenance.

The continual loss of life and great property damage resulting from crown sheet failures due to overheating emphasizes the need of a reliable low-water alarm which will give a warning, even though the present boiler appurtenances or the human element fails to function.

Drop Forged Draft Gear Lugs

THE ILLUSTRATION shows a drop forged draft gear stop of the type recently developed by the Standard Forging Company, Chicago, and one of which is being exhibited on the pier. Lugs of this and other designs are forged from open hearth steel, after which the rivet holes are punched. The illustration shown is a front lug.



A Drop Forged Draft Gear Lug.

Moisture Separator for Shop Air Lines

FOR MANY OF THE purposes for which the use of compressed air is applied in car and locomotive repair shops it is highly essential that the air be free from moisture and dirt. The Independent Pneumatic Tool Company, Chicago, has on exhibition a device known as the Thor air separator, which is particularly adapted for use in railway shops.

The construction is simple. Inside of a steel cylinder is placed a pipe, the entrance to which is arranged for connection to an air main and the exits of which are slots so placed that the air is blown against the cylinder walls at an angle which creates a whirling action and causes foreign matter to be removed, leaving pure air to be discharged at the outlets of the cylinder. There are no moving parts and the apparatus requires no attention except for drainage and occasional cleaning.

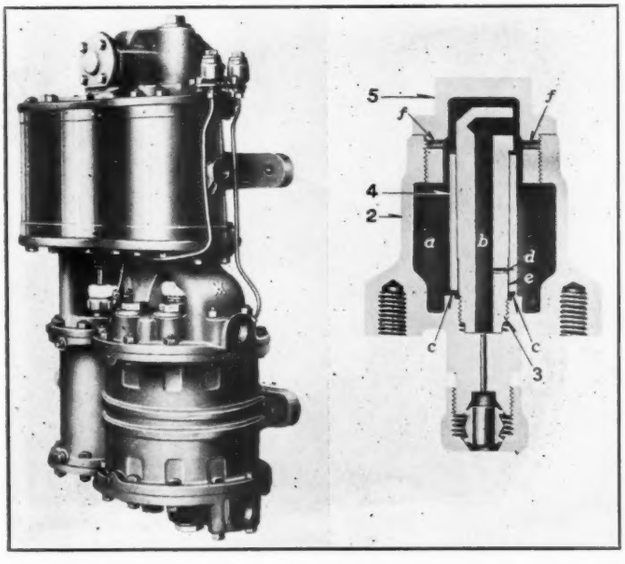
The use of this device is particularly desirable in connection with paint spraying operations and it is obvious that the efficiency of air hammers and motors is increased when clean, dry air is available. Freezing of air tools is positively prevented.

Two sizes are manufactured. A capacity of 150 cu. ft. of free air per minute is provided by No. 150 and 400 cu. ft. of free air per minute can be supplied by No. 400.

Automatic Lubricator for Steam-Driven Air Compressors

THE TYPE B AUTOMATIC LUBRICATOR for steam driven air compressors is a new device now being placed on the market by the Westinghouse Air Brake Company, Pittsburgh, Pa. One of the vital problems in the attainment of efficient air compressor operation is to provide means for supplying lubrication to the air cylinders in proper quantity and at regular intervals. Non-automatic methods may be employed and satisfactory results obtained as long as care and attention are exercised to provide just enough lubrication to keep the compressor in a properly lubricated condition, but experience has shown that this is very difficult to obtain. The ideal method is obviously that which involves feeding the proper amount of lubricating oil to the air cylinders during each cycle of the pistons and causing this feeding of oil to cease when the compressor stops operating. The *Type B lubricator* has been designed to meet these automatic requirements.

The construction and operation of this lubricator are simple, as will be evident from the illustration. There is an oil chamber *a* which is filled from the top when the cap nut 5 is removed. A stem 3 screwed into the body 2 has a central passage *b* communicating at the bottom with the pipe connection leading to the air cylinder, and at the top with chamber *a* through the cavity in the cap nut. An oil port *d* of definite size is located in the stem and connects passage *b* to an annular feeding cavity *e* which is formed by a recess in the stem and the neat-fitting sleeve, around it. This sleeve has two diametrically placed notches *c* at its lower end which connect chamber *a* with cavity *e*.



Type B Automatic Lubricator as Applied to 8½-in. Steam Driven Air Compressor

When the compressor makes its upward stroke, air is forced up through passage *b* and into the space above the oil in chamber *a*. This pressure forces the oil through notches *c* and into annular cavity *e* and from thence through port *d* into passage *b*. When the compressor makes its downward stroke, the air above the oil in chamber *a* is drawn back into the air cylinder of the compressor. As this action takes place, the oil which was forced into passage *b* on the upward stroke of the air piston is broken up into fine particles by the compressed air being drawn back through this passage, and is carried into the air cylinder in the form of a fine spray. This small amount of oil supplied regularly and reliably is ample to adequately lubricate the air cylinder.

Due to the ability of this type of lubricator to supply minute particles of oil in uniform quantities to the air cylinder of the compressor during each cycle of operation, one filling of its oil chamber will supply sufficient lubrication to the compressor air cylinder for the average trip of a locomotive.

Water Treatment at Wayside Tanks

IN TREATING LOCOMOTIVE feedwater with chemicals, which act inside the boiler, two problems have always been hard to overcome successfully. First, the difficulty of getting the chemicals applied with regularity, and, second, the attempt to treat all waters on a road division or district with the same formula or compound of chemicals. This latter is manifestly unscientific and impracticable since waters generally vary considerably at different sources, some coming from surface streams and others from driven wells. The formula that is chemically suitable for one source is not proper for all—in fact, may have a detrimental effect on the others.

The wayside tank method used by the Paige & Jones Chemical Company, New York, was designed to overcome these two objections to chemical treatment of road engine feedwater. At the pumping plant a feeder made from a piece of pipe is connected with the discharge line of the pump at the bottom, and with the suction line at the top, thus permitting a small stream of water to flow through the chemicals and back into the main line. When water is taken from the city pressure, the feeding device is attached to the feed pipe of the wayside tank.

The compounds are made in hard form, ball shape, weighing one pound each and of such a constituency that they will dissolve in the desired time, 8, 12 or 24 hours, depending upon the amount of water that is allowed to pass through the chemicals. This is regulated by a valve on the intake pipe to the feeder. The required number of balls, depending on the amount of water used, is placed in the feeder at the proper intervals, and with the valve correctly adjusted, all the water that goes into the wayside tank is uniformly treated, and with a formula suitable for that particular water.

Force Feed Locomotive Lubricator

A FORCE-FEED locomotive lubricator, built on the Kipp valveless principle, is being shown by the Madison-Kipp Corporation, Madison, Wis. This lubricator is usually attached to the valve chamber head and, being driven from the valve gear, it starts and stops with the engine. It is consequently automatic in its action and feeds more or less oil according to the speed of the parts that it must lubricate. The oil pumping mechanism contains no ball or spring seated valves.

This lubricator will always furnish the same quantity of oil regardless of the differences in viscosity due to hot or cold weather. Being located outside of the cab, the lubricator is out of the hands of the engineman and the oil feed may be adjusted to a definite allowance with assurance that this allowance will be maintained. Another advantage claimed for force-feed lubrication is that the consumption of oil is somewhat reduced, while the steady supply is responsible for lowering the cost of locomotive maintenance.

Large Size Boiler Plates

PROBABLY COMPARATIVELY FEW realize the large size of the plates which are being used today in some of the latest designs of locomotive boilers. The fact that the largest plates in the world have been and are now being rolled in American mills has made it possible to use a single sheet for the crown and sides of fireboxes, a practice which has recently become quite common.

Among the large size boiler sheets which have been rolled by the Lukens Steel Company, Coatesville, Pa., for locomotive fireboxes are those for the Union Pacific which were 250 in. by 183 in. by 3/8 in., some for the Atchison, Topeka & Santa Fe, 250 in. by 195½ in. by 3/8 in., others for the Union Pacific, 241 in. by 195 in. by 3/8 in., and also the large sheets for the new Southern Pacific locomotives on exhibition, 223 in. by 150 in by 3/8 in.

Sheets of very large size and of greater thickness are used for marine boilers. For such boilers, shell sheets have been rolled which were 144¼ in. by 246 in. by 2 in. and weighed 21,000 lb. each; also flanged heads, 183 in. diameter, 1⅛ in. thick and flanged 11 in. deep, the sheets before flanging being 199 in. diameter. For stationary boiler sheets have been used which were 280 in. by 196 in. by 2 3/32 in. and weighed 33,400 lb. each.

The mechanical difficulties of rolling such large sheets of only 3/8 in. thickness have been considerable and the fact that they have been made is a real achievement. The use of such sheets is distinctively advantageous to the railroads, as the number of seams is reduced with a saving in rivets and labor; also the possibility of leakage is decreased.

Type D Radial Buffer

With the original Type C buffer made by the Franklin Railway Supply Company, New York, owing to the tension imposed on the adjustable chafing plate through the springs, it has always been necessary when connecting the locomotive to the tender to call in the services of another locomotive. This locomotive was generally backed against the rear end of the tender, forcing it up to its own locomotive against the spring tension so that the drawbar pin could be slipped into place. All this has been made unnecessary with the type D buffer.

The adjustable chafing plate is equipped with a lug at each end through which a substantial bolt is passed. The chafing plate pocket in turn is also equipped with lugs supported by ribs which strengthen the slots by which the nuts are held from turning. The lug in addition to performing its regular work of drawing up the spring also compensates for the amount of metal which is necessary to cut out of the end of the main pocket. In connecting the locomotive and tender it is merely necessary first to insert the bolts in place and screw the nuts down by hand until the heads rest against the lugs on the adjustable chafing plate. In that position the springs will be at their free height. A wrench is then applied to the head of the bolt at each end and the adjustable chafing plate is drawn up against the spring tension a sufficient amount to enable the drawbar pin to be easily dropped through the eye of the bar. With this in place, the bolts are merely backed off and entirely removed, allowing the springs to force the adjustable chafing plate into position against the floating chafing plate in the regular manner.

If the engine and tender are connected and it is desired to separate them temporarily, the bolts are applied in the same manner, drawing up the adjustable chafing plate against the spring tension until the blocks are entirely free. As this removes all binding, the pin can be very easily taken out. The bolts are then left in place so that when reconnecting engine and tender, it will be merely necessary to bring them together as above stated and drop the pin into place. On new equipment the lugs on the chafing plate pocket can be cast integral and on old power it is only necessary to cut out a portion of the end of the spring pocket, bolting and welding thereto a small separate lug. On both old and new power a new adjustable chafing plate embodying the lugs will be required.

Shoemaker Radial Fire Door

THE SHOEMAKER radial fire door is the especial feature of this year's exhibit of the National Railway Devices Company, Chicago. This new development from the older types of Shoemaker horizontal and vertical doors combines the feature of air operation with balanced arc-moving doors and results in an effective automatic fire door that is locked shut when not operating. The doors are air operated, the control valves being opened and closed by connection from a foot pedal. By using two pistons of different size combined with suitable ports, the doors are cushioned both in opening and in closing, so that they do not open with a jar or slam shut. Provision is also made for cracking the door when entering terminals or at other times when steam is shut off, this being accomplished by opening a pet cock and then throwing over the lever shown at the top of the illustration.

Shoemaker Radial Fire Door

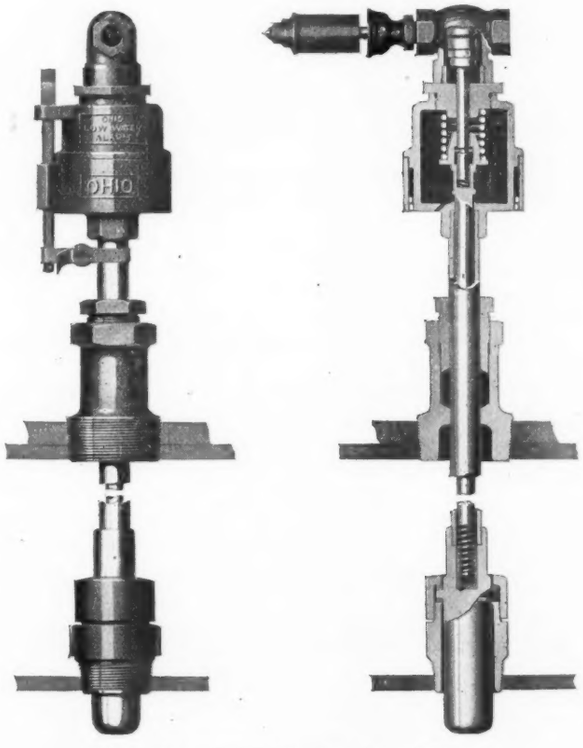
These doors insure protection against accidents from steam or gas blowing back through the fire opening, provide quick movement combined with quiet action, are easy to operate, and give full width of opening for the shovel.

Ohio Low Water Alarm

As an extra safeguard against the danger of explosions or burned crown sheets in locomotive boilers due to low water, the Ohio Injector Company, Chicago, has designed the automatic alarm shown in the illustration. This device includes a fusing chamber shell screwed into the crown sheet; and a fusing chamber plug which passes through this shell and extends 1 1-4 in. into the firebox and is held in position by a nut. The plug is insulated from shell and nut by an air space surrounding the plug and by two gaskets. The upper portion of the plug is provided with a chamber to receive the fusible material which consists of nothing but pure Banca tin.

A tube is screwed into the plug, passing up through a stuffing box in the wrapper sheet and supporting a valve cage. Into this cage is screwed the complete valve assembly that controls communication between a steam supply pipe from the boiler to the whistle in the cab. This valve assembled consists of a body valve on the upper end of a stem with a retainer and an opening spring.

The operating rod is threaded at its lower extremity and these threads are in engagement with the fusible material in the plug. The upper end is provided with a hexagonal section to permit of its being rotated by a wrench, and is in contact with the valve stem through a small expansion spring. A wrench passes through slots provided in the cage and cage sleeve, thereby closing access to the hexagonal portion of the rod. It is sealed in this position, as shown in the view at the left.



Ohio Alarm for Indicating Low Water

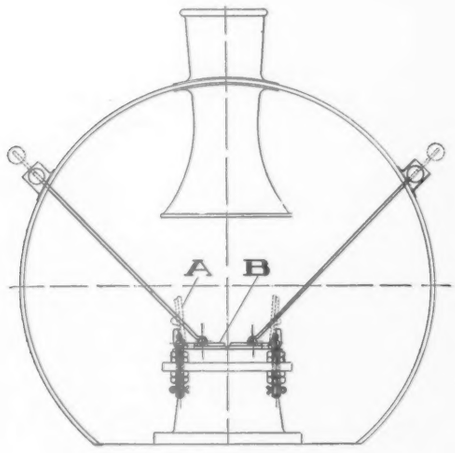
With the rod screwed up, the valve to the whistle is closed. As long as a proper level is maintained in the boiler, water will surround the upper portion of the plug and absorb the heat conducted by the extension into the firebox, thereby keeping the fusible material below its melting point and providing support for the rod. With the water lowered to a dangerous point it no longer surrounds the upper portion of the plug and cannot absorb the heat. This results in a rapid rise of temperature in the upper portion of the plug, causing the fusible material to melt. The rod then no longer having any means of support drops in the molten tin to the bottom of the chamber; it is assisted in its downward movement by the large spring which opens the valve, causing the alarm whistle to give warning.

When the alarm whistle sounds, giving warning that the water is low, although the crown sheet is not uncovered, the engineman should proceed at once to start his injectors and bring the water to the proper level, which will again surround the upper portion of the plug with water and thereby cool the tin and solidify it. The lower extremity of the rod is threaded nad having dropped to the bottom of the chamber in the plug will have the solidified tin cast around it somewhat in the form of a nut.

The engineman after making certain that he has 2 in. of water in the water glass, should break the seal and withdraw the wrench, which permits him to remove the cage sleeve and thereby gain access to the hexagonal portion of rod. He can not rotate the rod with a wrench, thereby shutting off the whistle, restoring the device to its initial position and placing it in readiness for another alarm. After replacing the cage sleeve and wrench the absence of the seal indicates that the device has operated.

Automatic Exhaust Nozzle Cover

Among this year's exhibits of the Detroit Lubricator Company, Detroit, Mich., is an automatic device for closing the exhaust nozzle openings when steam is shut off. The application shown is for a double low nozzle and consists of two covers or clack valves, hinged at the outer sides. The valves are held open by the escaping steam and are closed by gravity when the exhaust ceases. Attached to the valves are tell-tales which may be used for demonstrating purposes, but have nothing to do with the operation.



Detroit Exhaust Nozzle Cover

A noticeable feature of the device is the hinge connection which is designed to eliminate the possibility of cinders and carbonization preventing positive action. The use of these exhaust nozzle covers will prevent smokebox gases and cinders from entering the cylinder and causing carbonization, thus increasing the life of cylinders, piston rods, valves, valve stems, piston rings, bushings and packing.

Sand Drier Stove

AN IMPROVED SAND DRIER stove of the cone type, known as the Perfection, has been placed on the market recently by the Princeton Foundry & Supply Company, Princeton, West Va. This stove has five or more downwardly sloping cones which set on top of the firebox, having an opening of 1¼ in. between each other. This feature allows the draft of heated gasses going to the smoke pipe to pass out through the openings between the cones and draw a large portion of the steam and dampness out of the sand instead of forcing it out through the body of the sand as is done in the ordinary drier.

The sand hopper around the stove tapers more than 20 in. from top to bottom, leaving a space at the bottom of 6 in. to 8 in., the height of the firebox, where the remaining amount of dampness—left after the sand has passed the cones—is removed by the direct heat of the firebox. As it is necessary to carry only a small amount of fire to obtain full capacity, this stove is unusually economical in the use of fuel.

For general railroad service, where the stove is to be operated 24 hours a day, stoves with 6 or 7 cones and a hopper 50 in. to 56 in. high are commonly used. The capacity of such a stove is upwards of 425 tons per month. As a protection and aid to long life, the firebox is lined with a special fire brick lining.

Although the first stove was only made in 1918, they have been installed on a number of railroads which are said to report savings in fuel and labor with an increase in capacity.

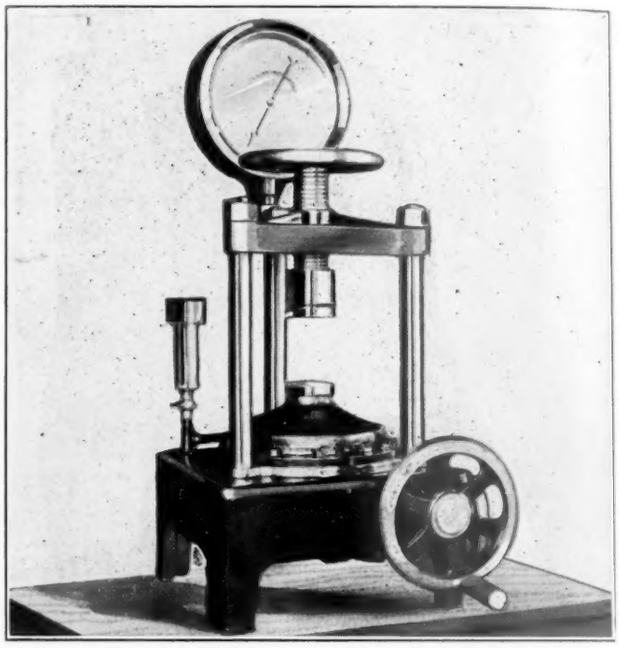
Hand Fire Extinguisher

THE FIRE GUN MANUFACTURING COMPANY, INC., New York, is exhibiting a new line of hand fire extinguishers, made in three sizes which range from 1 quart to 1½ quarts capacity. The double-action of this new device is designed to insure a steady stream of a special fluid which instantly vaporizes when it strikes the fire. The heavy gas so generated forms a blanket, excluding the oxygen and extinguishing the fire. The Fire Gun is easily operated and can be discharged in 20 seconds. It is made of brass and built to withstand rough usage. The liquid is said to be effective where water is useless, since it does not freeze at temperatures down to 50 deg. F. below zero. It is a non-conductor of electricity, does not deteriorate or evaporate in the gun and, it is said, will not injure the most delicate fabrics. A more recent addition to the Fire Gun Manufacturing Company's products is Fire Gun Type B, a 2½-gallon soda and acid fire extinguisher.

Pittsburgh Cement Tester

VARIOUS ENGINEERING bodies over the country have been giving the subject of testing cement in compression considerable attention for the past two or three years and have seriously considered the elimination of the tensile test and the substitution therefor of the compression test. This is due to the fact that concrete is considered good for compression only. To meet the demand for a compact, low-priced machine which would at the same time be of ample strength and yet simple and quickly operated by hand, the Pittsburgh Testing Laboratory, Pittsburgh, Pa., has designed and built at its own shop a cement-testing machine of the compression type.

The operation of the machine is simple. The 2-in. by 4-in. cylindrical specimen is placed on the ram in the center, the upper spherical head is brought down into contact by the handwheel on the square-threaded upper screw, and hydraulic pressure is applied on the ram by turning the handwheel in front in a clockwise direction. The pressure is shown by the gage. After the specimen has been broken the handwheel in front is given a turn or two in a counter-clockwise direction, after which the ram is returned by the handwheel at the right side.



Simple Machine for Testing Cement in Compression

A dead-weight tester, shown at the left of the ram, may be used to test the accuracy of the gage.

The area of the ram is 50 sq. in., and a rubber diaphragm is used to keep the glycerine from leaking past the ram. The capacity of the machine is 15,000 lb., which is obtained at a pressure of 300 lb. per sq. in. on the liquid. The outer graduations on the dial show the total load, while the inner graduations show the load in pounds per sq. in. on the 2-in. diameter cylinder of cement.

Air Drills for Light Work

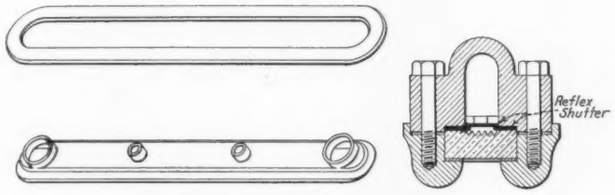
PNEUMATIC DRILLS which are remarkable for their convenience, small size, and lightness in relation to the capacities available, have been added to the Thor line of pneumatic tools and are being shown by the Independent Pneumatic Tool Co., Chicago.

These drills, known as the "Pigmy" type, are of 4-cylinder design, with an aluminum casing, and ball bearings throughout. Three sizes are available with drilling capacities up to ¼ in., ⅜ in. and ½in. respectively. The weights range from 5 lb. to 6 lb. according to the capacities. In addition to their usefulness for light locomotive drilling such as tell-tale staybolt holes, these drills may be equipped with a brush or may be adapted in car work to light drilling, to wood boring, and driving screws. The construction throughout is of the durable type required in railway shops.

Reflex Water Gage Shutter

AN INTERESTING PROTECTOR or shutter for water gage glasses of the Reflex or Klinger types has been perfected by the Sargent Company, Chicago; after having been thoroughly tested out in locomotive service it is now being shown for the first time. This shutter consists of a thin, non-corrosive diaphragm which is located between the water space and the gage glass. Its use will prevent or very greatly reduce the three kinds of wear or erosion which reduces the life and effectiveness of Reflex gage glasses. Distilled water, constantly dropping from the condensation in the water gage top, has a strong affinity for glass. The shutter is, therefore, so shaped that such condensation is prevented from coming in contact with the exposed upper part of the glass.

Water gages must be frequently blown out and this rush of steam and water has an erosive effect on the inner Reflex glass face which the shutter also prevents. Moreover, the shutter is so fitted between the gasket and the glass as to give added tightness to that steam joint, consequently preventing leakage which quickly ruins the glass.



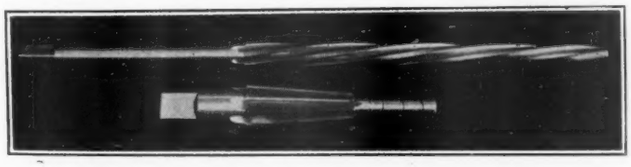
Sargent Reflex Water Gage Shutter

It will also be noticed from the illustration that the shutter is provided with holes which allow a free circulation and the clearances are such that there is no difference in the appearance of water and steam spaces from that of the gages not equipped with a shutter.

In addition to the water gage shutter, the Sargent Company is showing a locomotive water gage column.

Spiral Fluted Taps

AN ENTIRELY NEW FEATURE in staybolts is being exhibited this year by the W. L. Brubaker & Brothers Company, Millersburg, Pa., in their spiral fluted tap. Among the advantages claimed for the spiral flute is that in case a thread tooth becomes broken, the tap will still tap a hole of exact size. Also, with the spiral



Brubaker Spiral Fluted Tap

flute, the cuting action is at an angle to the work being performed; hence, metal is removed with less resistance, thus increasing the life of the tap to a noticeable extent.

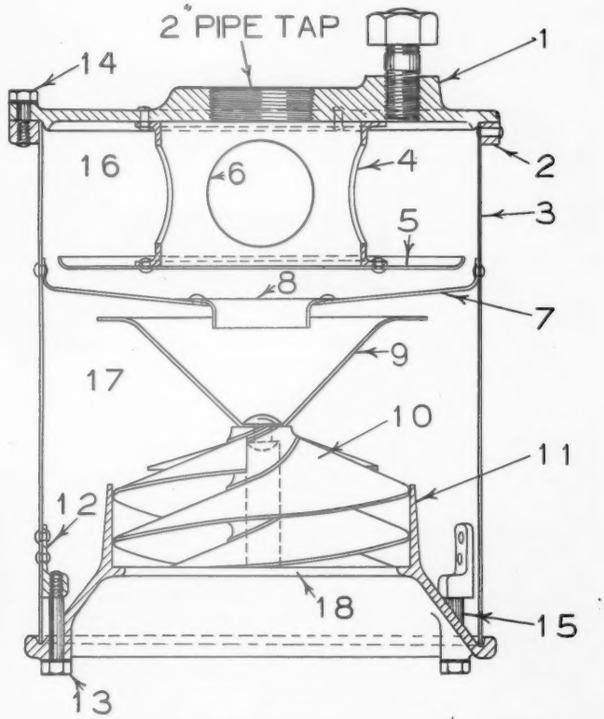
Special small tools adopted as standards by the American Railway Tool Foremen's Association, are included in the exhibit. These standards comprise the radial staybolt tap, spindle tap, button head radial staybolt tap, standard boiler head and wash-out tap.

Welding or closing in of old staybolt holes has placed a severe test on the threading tool and the spiral fluted staybolt tap was devloped and tested out for this severe work. The results are so satisfactory on this difficult work that the spiral flute is being adopted for all classes of work.

Centrifugal Air Pump Strainer

AN AIR PUMP strainer of a distinctively novel and interesting type is being exhibited by the New York Air Brake Company, New York. This strainer as shown in the illustration, consists of a cast iron top plate *1*, to which is attached a cylindrical shell or chamber *3* and a bottom cover *11*. The chamber is divided into two parts by a partition *7* with a central opening *8*. The bottom cover *11* holds a spiral *10*, to the top of which is attached a bell-shaped deflector *9*. In the upper chamber and attached to the top plate is a cylindrical sleeve *4*, having four openings *6*, the bottom of the sleeve being closed by a baffle plate *5*.

In operation, air enters the bottom at *18* and in passing up through spiral *10* receives a rotary motion. After leaving the spiral the air comes in contact with deflector bell *9*, which causes the particles of entrained dust to strike the outer wall and fall down into the lower portion *15*, where they are deposited. The air flow is next reversed, passes inward between deflector *9* and partition *7*, reverses again to flow up through opening *8* when it strikes the baffle plate *5*. This diverts it to the outer wall of chamber *16*,



A New Type of Strainer for Air Compressors

from which it flows through the openings *6* and through the pipe connection to the compressor. Any particles of dust which fall down from partition *7*, baffle plate *5* or outer walls of the upper chamber, will be deposited in the bell-shaped deflector *9*. By removing the bottom cover *11*

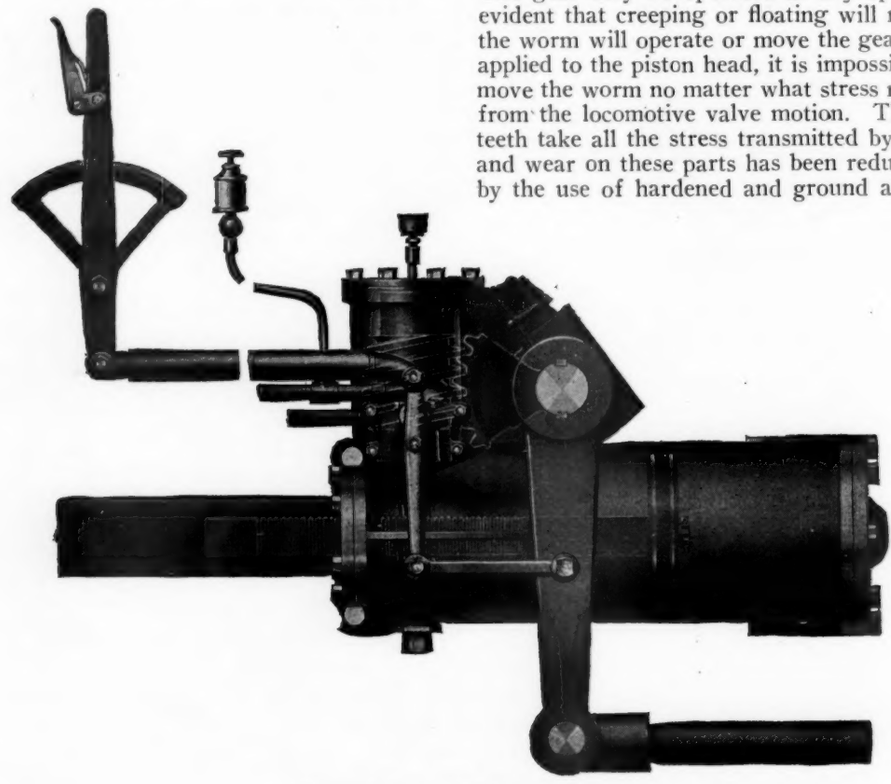
any dirt which has accumulated around its outer edge or in the deflector 9 may be quickly and completely removed.

This strainer not only has a high initial efficiency, but this efficiency will remain constant instead of being gradually decreased as is the case with strainers which depend upon curled hair or other substances which slowly fill up with dirt until removed and cleaned.

Changes in Barco Reverse Gear

THE POWER REVERSE GEAR shown this year by the Barco Manufacturing Company, Chicago, embodies a new idea in power reversing mechanisms. The gear does not depend upon the sensitiveness or tightness of the valve or piston to hold it in position, and eliminates the balancing feature.

It is designed to use either air or steam, which may be alternated without causing any dis-arrangement, or without requiring any adjustments. Air is used to operate the gear, and not to hold it in position. As soon as the gear has been moved to the required point of cut-off by means of the quadrant lever in the cab, the air is exhausted and both ends of the cylinder remain open to the atmosphere through the exhaust ports in the valve until the position of the quadrant lever in the cab is again changed.



Barco Improved Reverse Gear

It can readily be seen that a leaky valve or leaky piston rings cannot cause the gear to creep or float, and that no air is consumed between the periods of adjustment. For instance, if the gear is hooked up to the proper cut-off on a road engine, no further air will be required until such time as it is necessary to change the cut-off, due to variation of speed or grade.

The operation of the Barco reverse gear is controlled by the usual quadrant lever located in the cab, connected to a rotary valve attached to the body of the gear. When the lever is in central or neutral position, both ends of the cylinder are open to the atmosphere through the exhaust ports in the valve. When the quadrant lever is moved either forward or backward, air is admitted to one end of the cylinder, immediately moving the piston in the direction desired. A vertical, one-piece steel pinion and worm is connected directly to the piston by the horizontal rack, which takes the place of a piston rod. The worm engages with a segment or gear, attached to the reach-rod arms through the shaft, which is in one piece with the gear or segment. A floating arrangement, connecting with the quadrant lever at one end, and the reach-rod arm at the other, with a central connection to the rotary valve, makes the operation of the link motion and the quadrant lever simultaneous. It will thus be seen that any movement of the quadrant lever will immediately produce a corresponding movement through the reach-rod arms on the link motion.

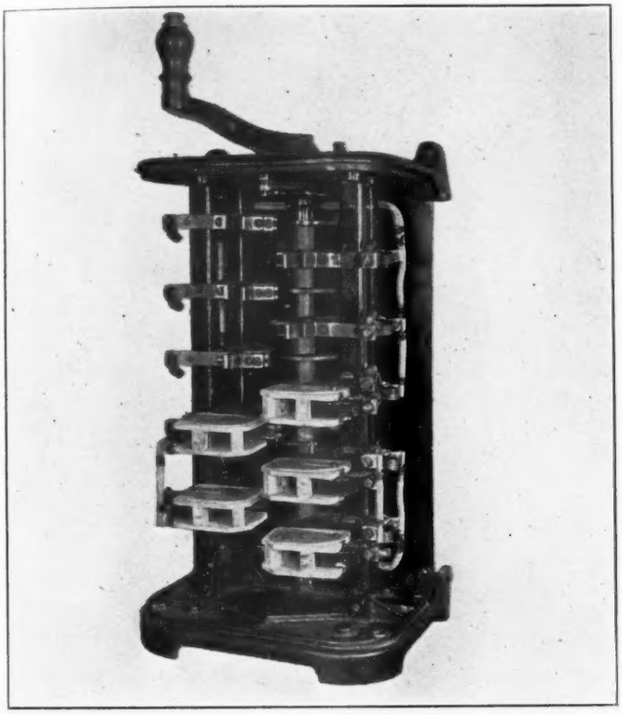
The combination of worm and gear insures positive and accurate adjustment, and produces a maximum amount of power with a minimum pressure and volume. The gear may be operated at any speed desired. It is evident that creeping or floating will not occur, as while the worm will operate or move the gear when pressure is applied to the piston head, it is impossible for the gear to move the worm no matter what stress may be transmitted from the locomotive valve motion. The worm and gear teeth take all the stress transmitted by the valve motion, and wear on these parts has been reduced to a minimum by the use of hardened and ground alloy steel forgings and castings, which operate in a bath of oil similar to the differential on an automobile.

It sometimes happens with all power reverse gears that the air or steam supply pipes are cracked or broken in service, thus causing an engine failure. In fact, a number of railroads have installed flexible joints in the supply pipes to eliminate breakage from expansion or vibration. An interesting feature of this gear is that the engineman or fireman may adjust the valve motion in any position desired, either forward or backward, by applying an ordinary 12 in. monkey wrench to the hexagon end on the bottom of the pinion, which extends below the body of the gear. This eliminates possibility of reverse gear failure, which might be caused by broken pipes, levers, etc.

Controller for Turntable Motors

ONE OF THE devices being exhibited by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is a special form of drum controller for the wound-rotor induction motors used on turntables. The controller is designed to control two motors in cases where they required speed of turntable operation makes the use of two desirable.

The contacts are of the rolling type and are actuated by cams. The main line carrying contacts are protected



The Controller Has Rolling Contacts and Magnetic Blow-Outs

against burning by magnetic blow-outs of the same type that are used on magnetic contactors. It is claimed that this form of construction considerably lessens the burning and pitting of the contacts and that the controller is particularly suitable under conditions of hard and frequent service.

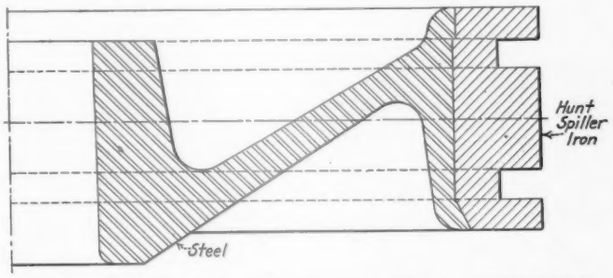
Rogatchoff Piston Bull Ring

STEEL PISTONS have the bull rings attached in different ways: by bolts, rivets, pins, plugs, retaining rings, and electric welding. The application or removal of the bull rings is a time-consuming process and in many cases is responsible for breaking cylinder heads and cylinders, or bending piston rods and main rods.

The improved method of shrinking bull rings on pistons, as developed by the Rogatchoff Company, Baltimore, Md., eliminates all of the above mentioned attachments to hold the bull rings on the piston and there is nothing to become loose and cause damage.

The front end of the piston for a distance of ¾ in. is turned 1/32 in. larger in diameter than the main portion. When putting on a bull ring it is expanded sufficiently to slide over this enlarged portion and when the ring has cooled this acts as an effective retainer. At the inner end the bull ring comes into contact with an enlarged tapered shoulder.

The Rogatchoff method of shrinking the bull ring on the piston cuts down the labor to less than other methods



No Separate Retaining Devices Are Required With This Bull Ring

of applicaton. Such a bull ring has been tested in heavy freight service, the mileage thus far obtained being from 35,000 to 40,000 miles.

Thermic Syphon Tests on Central of Georgia

TO DETERMINE the merits of the Nicholson thermic syphon the Central of Georgia decided to make a trial application. The test was made on a 1600 Class locomotive; these have never been considered free steamers and at times have given considerable trouble due to lack of steam.

Locomotive 1605 used in the test is a 10-wheel type saturated locomotive having cylinders 21 in. diameter by 26 in. stroke. The firebox is of narrow type, 40¾ in. wide by 108 in. long, with a grate area of 30.56 sq. ft. The steam pressure was 180 lb., and the tractive effort 28,250 lb. This size firebox is suitable for a single syphon, which was designed to present 31 sq. ft. of additional firebox heating surface. Two arch tubes were also used in this firebox to aid in supporting the arch brick. The complete firebox heating surface was 216 sq. ft.

Locomotive 1609, chosen to run opposite the 1605, came out of the shop with similar repairs about the same time as the 1605. The two locomotives were alike in every respect except the firebox, the 1609 having arch tubes but no syphon. The firebox heating surface was 185 sq. ft.

During the test care was exercised to hold all conditions as nearly uniform as possible. Three round trips on each locomotive were run and the data secured were used in compiling the results. Water was carefully measured and coal was as carefully weighed, an extra allowance being provided where necessary to build or maintain the fire when not in use on the road. Losses due to safety valve injectors, etc., were carefully recorded and considered. Feed-water temperature and temperature of the atmosphere averaged respectively the same for both locomotives. Coal analyses showed that the quality of fuel was practically the same.

The test was conducted on a division totaling 200 miles for the round trip and the average train load varied only 10 tons. The amount of coal used per thousand gross ton-miles was 335 lb. for the non-syphon locomotive 1069, as compared with 288 lb. for the syphon locomotive 1605, a difference of 14 per cent in favor of the 1605. In addition the syphon locomotive used nearly six per cent less water per thousand gross ton-miles than the opposite

locomotive. General results are shown in accompanying table.

As for maintenance costs, locomotive 1605 has been in service nearly a year and there has been no expense involved in connection with the syphon. It was only necessary to wash out the syphon when the remainder of the boiler was washed.

As a result of the test and of subsequent performance of locomotive 1605, the Ceneral of Georgia contemplates equipping the remainder of the 1600 Class locomotives and locomotives of other types.

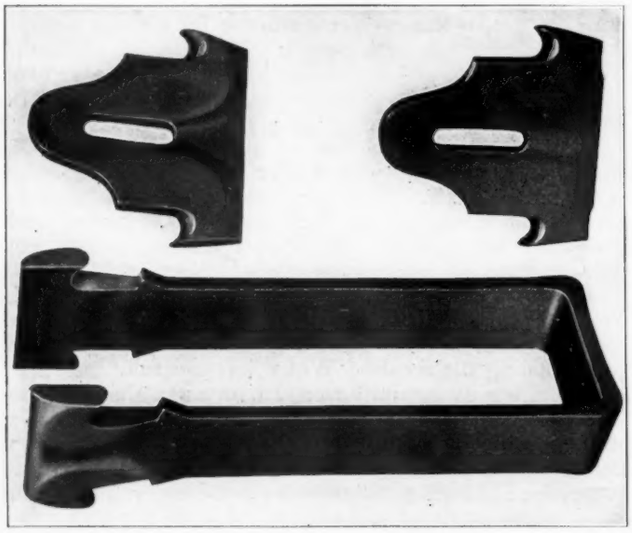
SUMMARY OF RESULTS OF TEST

	Eng.1609 New Syphon	Eng.1605 favor 1605 Syphon Difference	Eng.1609 Non Syphon	Eng.1605 favor 1605 Syphon Difference	Eng.1609	Eng.1605 favor 1605 per cent.
Date of test	Dec. 1921	Dec. 1921				
Tonnage—average per trip	256	266				
Mileage per trip	200	200				
Gross ton—miles—average per trip	51,200	53,200				
Number of cars—average per trip	5	5.17				
Car mileage—average per trip	1,000	1,034				
Total coal used—as fired—lb.—average per trip	17,160	15,317				
Total water used—lb.—average per trip	95,807	93,769				2.127
Lb. coal (as fired) per 1,000 gross ton-miles	335	288				14
Lb. coal (as fired) per locomotive-mile	85.8	76.6				10.7
Lb. coal (as fired) per car-mile	17.16	14.81				13.7
Lb. water evaporated per lb. of coal	5.58	6.12				9.7
Lb. water per 1,000 gross ton-miles	1,871	1,726				
Annual fuel consumption-tons	3,089	2,758				
Annual cost at $3.73 per ton on tender	$11,522	$10,287				
Annual saving per locomotive						$1,235

Key Connected Forged Coupler Yoke

THE SALIENT FEATURES of the key connected forged coupler yoke, which has been perfected recently by the Standard Forgings Company, Chicago, and is now ready for the inspection of those attending the conventions, have drawn much favorable comment.

The complete yoke consists of three parts which include two head members and a strap. The shapes of the

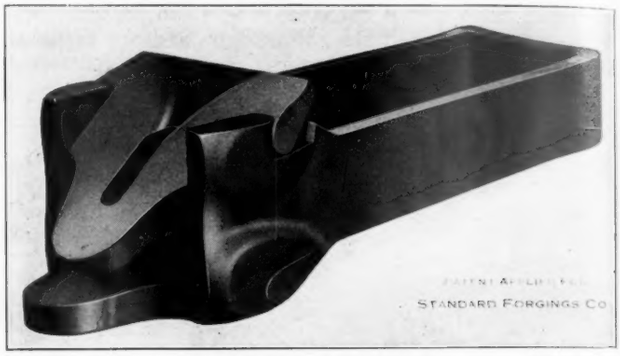


Head Members and Strap of Key-Connected Forged Coupler Yoke

parts are such that they can be assembled without difficulty and liberal surfaces and sectional areas are provided for meeting the severe service requirements.

The parts are forged from solid steel billets. The head members are drop forged and fitted so as to present a unit of strength and dependability. The body of the strap is drawn out under a hammer and the ends are drop forged.

Two important features make the use of this yoke attractive on both tenders and cars. The process of forging eliminates any possibility of porosity and makes the sectional area a practically certain quantity. The three-part construction makes it possible to renew any part



Yoke Partially Assembled

separately so that the entire yoke does not have to be scrapped in case the limit of wear at the key-way has been reached or other condemning causes exist. Should repairs become necessary, either the strap or the heads can be salvaged. The head members are interchangeable and can be replaced easily.

Otis Train Control

THE OPERATION of a new train control device is being shown by the Otis Automatic Train Control, Inc., Spokane, Wash. It is operated by movable ramps placed alongside the track. The normal position of the ramps is at danger with the center peak four inches above the rail; it is held in this position by a weighted cam unless pulled down for a clear block by a solenoid in circuit with the track.

Attached to the locomotive are two plug type rotary brake setting valves with hollow shoes, one being used when running forward and the other when backing up. Connections to these valves are reversed by the engineer in accordance with the direction in which he is running. A speed control attachment is also included which consists of a mechanical governor driven by a belt from the track axle. When the speed at which the governor is set is exceeded, it acts to discharge air from the brake pipe, thus causing an application of the brakes, and when the speed has been reduced the exhaust is closed and air is again admitted to the brake pipe to cause a release.

Air Cooled Rod Packing

ONE OF THE MOST INTERESTING of recent developments in metallic packings for piston rods and valve stems is the one shown by Morris Brewster, Inc., Chicago. In this packing the ordinary arrangement of parts has been reversed, the sliding plate being placed at the bottom of the box and the spring at the outer end. The packing itself is of the well-known King type. Only the sliding plate and inner face of the packing are exposed to steam pressure. The spring and outer end of the gland box are open to the atmosphere and consequently remain relatively cool.